Watershed Monitoring and Assessment Design Workbook

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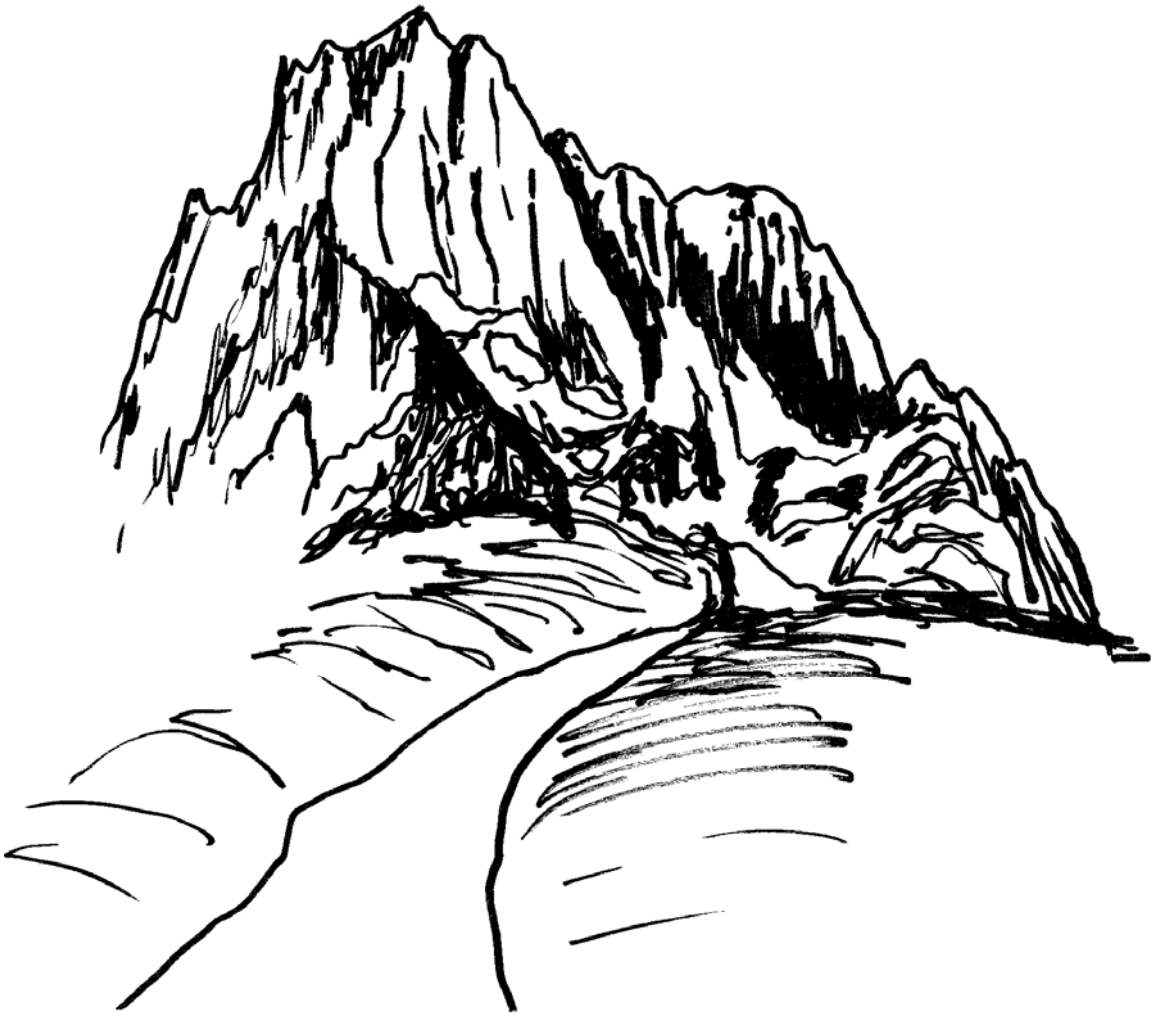

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Funded by United States Environmental Protection Agency, Region VIII

Rocky Mountain Watershed Network Presents:

WATERSHED MONITORING AND ASSESSMENT DESIGN WORKBOOK

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Watershed Monitoring and Assessment *Design* Workbook

Plan an Information Rich System (not Data Poor)

Workbook Introduction and Overview

"Can we afford clean water? Can we afford rivers and lakes and streams and oceans, which continue to make life possible on this planet? Can we afford life itself?..These questions answer themselves."

Senator Edmund Muskie (1972)

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If you know all the background, overview and perspective you need to, jump right to Section H and begin with how to use this workbook. You can always return to the overview material. You never know what you might learn.

"***Ubuntu*** is very difficult to render into a Western language. It speaks of the very essence of being human…..You share what you have. It is to say, 'My humanity is caught up, is inextricably bound up in yours." We belong in a bundle of life. We say, "A person is a person through other persons." It is not, "I think therefore I am", rather it says, "I am human because I belong". I participate. I share. A person with ***ubuntu*** is open and available to others, affirming of others, does not feel threatened that others are able and good, for he or she has a proper self assurance that comes from knowing that he or she belongs in a greater whole and is diminished when others are humiliated or diminished, when others are tortured or oppressed, or treated as if they were less than who they are." Desmond Tutu, from his book *No Future Without Forgiveness*.

Go and have or be ***Ubuntu***…

A. Purpose of this Watershed Monitoring and Assessment Workbook

The Rocky Mountain Watershed Networks "Watershed Monitoring and Assessment Guidance Manuals" provide a framework for planning effective monitoring and assessment activities. Effective is defined as a plan designed to guide implementation so that the results can be evaluated. A plan that will generate data and information, which is assessed for identified purposes and users or audiences.

These guidance modules are intended to support the planning and technical needs of any organization or entity conducting or planning to conduct watershed monitoring or assessment activities. This includes citizen, governmental or mixed watershed groups, agencies, consultants, academia and individuals.

In doing so, the Guidance Modules recognize that not all monitoring and assessment activities are equal in perspective, outcomes/goals, scope, scale, rigor, cost, duration and or complexity. These modules are intended to acknowledge the value of planning and documentation. That the key to effective monitoring and assessment is planning one, not starting at implementation. Resources expended for the effort of planning are less than those that are wasted due to lack of planning during implementation. The appropriate decisions regarding scope, scale, duration and outcomes will be made during the process of planning and discovering information about perspective, complexity, rigor and cost. Documentation is essential for our data and assessment to be credible, reproducible and comparable. Resources are to scarce for all entities monitoring and assessing to leverage and streamline our efforts.

The Guidance Modules provide a planning process that can be used to design any monitoring or assessment activity. The amount of time, rigor and resources you spend with each step or component will be a function of your needs; it is not a one size fits all answer. The content employs primarily examples for wade able streams, but covers lakes and wetlands as well as chemical, physical, biological and human media's. The content is not necessarily placed based and can be applied anywhere. The Clean Water Act Module contains information for the Rocky Mountain States of Colorado, Wyoming, Utah, Montana, New Mexico, North Dakota and South Dakota; however the information exists for all states.

In addition, these modules consider the need to meet entities where they are in the planning or implementation process; usually that is some where in the middle and not at the beginning. Thus, the planner can enter the "planning process" at any step and the planner will eventually cover all steps.

The primary reasons for developing this Workbook and associated training model and material are a response to:

1. In the Rocky Mountain Region, watershed groups and service providers to watershed groups identified this as a priority to assist making their efforts more effective, efficient and measurable.

   The number of watershed groups have increased two to ten fold in the region. Groups that are interested in or are conducting monitoring and assessment activities have had limited success for

a variety of reasons. In addition, these groups are being asked to do more by agencies and others to assist in achieving their mandates or goals.

2. Diminishing state budgets and increasing requirements of the Clean Water Act require a collaborative approach to gather and assess data. Watershed plans, watershed assessments are both increasingly required to receive Section 319 Non Point Source Funds, other state and federal grant assistance. To develop, implement and evaluate total maximum daily loads (TMDL's) a certain amount of planning has to go into effective monitoring and assessment.

3. Other resources or content does not meet the needs of watershed groups.

   It would be impossible to have a one size fits all guidance, if for no other reason the volume would fill a semi-truck. Existing guidance manuals do provide information on monitoring and assessment planning and implementation, however, most of them are not complete (missing a component), to vague or to technical and laden with content and lacking a clear process. These guidance work books are designed to complement existing resources, sources of scientific concepts, analytical procedures and other "how to's". At the end of these workbooks, you will have a documented monitoring and assessment plan, as well as other sub-plans such as an action plan (identify future information and resource needs), inventory plan, data management plan, sample plan, quality assurance plan, analyses and information plan and evaluation plan.

   Other resources or manuals are either not packaged or written in a manner that is understandable and meaningful to local watershed practitioners. Many manuals are filled with jargon and acronyms and require a fairly high degree of background to understand, much less use. Many of the local practitioners do not know where to start. Furthermore, no manual exists that articulates in the planning phase, how to connect the people component with the technical aspects of gathering and analyzing data with communicating and delivery to a targeted decision maker.

   What this workbook framework is intended to provide is an approach or a way of thinking and planning that is common to all assessment and monitoring projects, that is, if what you want is an information generating system that provides the information you want and need, in a way that you have a product in hand and that can be evaluated.

4. The need to communicate what we are doing and not doing in order to align watershed monitoring and assessment activities within our own organizations, watersheds, states and regions. The ability to summarize, document and communicate what each monitoring and assessment program is designed to achieve and how is essential. This work book provides those tools.

5. Proper and effective planning generates more reliable, consistent and measurable outcomes. If more entities were able to plan and document their monitoring and assessment activities, the results would be more and better information available to leverage, streamline, reduce duplication, increase opportunities for collaboration and hopefully increase watershed protection and restoration effectiveness.

6. Need for training to increase knowledge and skill. Any manual, including this one is only as useful if it is the hands of practitioners who use it, thus it must be accompanied by an outreach plan. These guidance modules are designed to be content modules for conducting training and include training materials.

   Watershed monitoring and assessment is a dynamic and organic task that is never completed, and thus should be planned and evaluated frequently. This is the exception not the norm. The amount of rigor and resources needed and used for planning will vary. Furniss 2001 evaluated multiple monitoring and assessment efforts and summarized his results in the following table. His summary validates the need for planning and documentation monitoring and assessment efforts. It is not to say that the evaluation on the right, "as it sometimes is" versus the left "as it should be" is right or better, it may be appropriate. The point is that the reader or data user doesn't know because the information is not documented or available and often that is correlated with lack of planning.

B. What is Watershed Assessment?

What is a Watershed?

It is useful to agree upon common definitions. First we need a common definition for a watershed. ***A watershed*** is the "region draining into a river, river system or water body above a particular point". This includes the river itself as well as the riparian zone and upland area.

Watershed ecology is comprised of a physical template that includes processes which shape the watershed such as climate, hydrology and geomorphology. The physical template dictates the biological setting, which is influenced by the natural (spatial and temporal scales) and human systems within it. The result is a watershed structure that combines the physical living (biotic) and non-living (abiotic) components and watershed function that can be, to some degree, characterized and assessed for quality and change. This watershed monitoring and assessment work book follows watershed management underlying principles of 1) that watersheds are natural systems that we can work with, 2) watershed management is a continuous process and needs a multi-disciplinary approach and thus so does monitoring and assessment, 3) successful management employs partnering, sound science, taking well planned actions and achieving results (being able to measure), and 4) and a flexibility.

Forces of Change

Forces that cause negative changes in a watershed can be the result of human activities or natural disturbances. They are sometimes referred to as stressors. Examples of **stressors** include:

- the **presence of pollution** (e.g. nutrients, pathogens, toxins) or physical disruptions (e.g. flow control, channelization) caused by human activities
- **natural disturbances** such as droughts, ice storms, wind shear, or catastrophic floods.

It is important to add that certain factors and forces can cause positive effects, improve watershed conditions and/or lessen negative impacts of stressors. Examples of **positive factors** include:

- naturally occurring, **functional, landscape and geological conditions** that protect water and habitat quality (well vegetated uplands and riparian areas, wetland buffers, stable soil characteristics, etc.),
- **human induced changes** to the landscape or water body (best management practices, dam removals, etc.).

Watershed critters and people are exposed to these stressors in the water or on the land to varying degrees. This **exposure** is usually measured as:

- the **concentration of pollution** in the water (a direct exposure measurement),
- changes in the extent or frequency of the **use of the water** for swimming and fishing (designated uses impact assessments),
- **use of specific habitats** by animals during sensitive parts of their life cycles (the integrated effects the stressors have on indicator species and/or communities).

The watershed resources respond to the stressors in various short and long term ways. Examples of watershed **response** include:

- the habitat quality and extent,
- the condition of aquatic life,
- the stability of the stream channel, littoral area, sea grass bed, etc.

What is Assessment?

Watershed assessment has been described for a variety of contexts and purposes. Some examples might include "the analysis of watershed information to draw conclusions concerning the condition of a watershed', or "a process for evaluating how well a watershed is working", or "a process that characterizes current watershed conditions at a course scale using interdisciplinary approach to collect and analyze data". The EPA defines it as "the translation of scientific data into policy-relevant information that is suitable for supporting decision making and action at the watershed level".

Reference Conditions

A common way to conduct an assessment is to gather new and/or existing information on the conditions in the watershed using indicators of stress, exposure, and response. Then compare the conditions found to benchmarks that describe a healthy watershed. These benchmarks are called "reference conditions." They typically describe conditions that are only minimally affected by human activities and/or major natural disturbances. Reference conditions can be actual conditions found and measured at real locations (known as "reference sites") that are relatively undisturbed. Or they can be theoretical conditions that describe goals for the waters based on scientific theory, summaries of data from similar waters, or risk analysis. A common example is state water quality standards. Reference conditions might also be some combination of actual and theoretical conditions. Reference conditions can be described in terms of maximum levels of specific pollutants (stressors) or in terms of the desired conditions of watershed processes, functions, and living communities.

Assessment ***is not*** monitoring data alone, nor is it monitoring and data collection only, or a consolidation of existing information alone, historical or baseline data alone, identification of a problem alone, a plan or an endpoint. An assessment ***is*** an objective problem-solving tool that identifies potential causes of problems, the scientific interpretation of watershed information or data, leading to conclusions about watershed condition, a tool to identify data and information gaps, analyses that can be used to develop appropriate actions (like restoration), a component of a watershed management plan or package that leads to planning, implementation, evaluation and more monitoring.

For this work book, we believe the common element of most definitions for watershed assessment, ***is the process composed of actions that include planning, collecting/gathering, analyses, interpretation and reporting that lead to a better understanding of watershed condition, to assist and direct further action.*** The ultimate measuring stick is to be able to take action from a watershed assessment. That action might be in the form of a recommendation, it might be gathering more data or it might lead to restoration, but it leads to action, it is not the end. Watershed assessments attempt to measure and understand what factors might affect watershed health, the levels of exposure or extent of these factors, and the watershed's response.

Watershed in a Management Context

So, a watershed assessment is a crucial step in a larger process that involves setting expectations, assessing the watershed conditions to see if these expectations are met, identifying problems areas to be restored and/or healthy areas to be protected.

Once watershed protection/restoration strategies are in place, assessment gives feedback as to whether they are working.

Useful watershed assessments don't just happen. They are the result of careful planning. The watershed assessment design process is described in Part III. We believe that these assessments should be a collaborative effort among community decision-makers, watershed based organizations and agencies. The targeted goal is for the assessment results to be useful for planning and actions at all levels of that collaborative.

A watershed holds the boundary for all the water that lands within it for the people, animals and plants. Thus, we encourage you to be holistic in your watershed assessment approach. Include chemical constituents in water, soil, air and organisms. Include physical habitat of the stream, lake, wetland, riparian zone, flood plain and multiple landscapes. Include bioassessment and criteria for the organisms, large and small. Include human disturbances such as impervious surface, discharges, land uses, hydro modifications, alterations to morphology, banks and flood plains, effects of exercising water rights and water delivery systems. But also include the people, their uses, perceptions, beliefs, values and spirituality. They may or may not be the problem but the probability is great that they are the key to change and solutions.

The EPA has long marketed the watershed approach for the work under their responsibility, which has three key components. First, a defined *geographic boundary*, watersheds are nature's boundaries; you will define your geographic scope. Second, *continuous improvement* based upon sound science, data, tools and techniques to inform the processes of characterization, prioritization, planning for action and evaluation. And finally, the essential contribution of *partnerships and stakeholder leadership.* This is because watersheds transcend political, social and economic boundaries. Thus, it is important to empower local interests in designing and implementing strategies to achieve watershed goals and visions.

Attributes of Successful and Failed Watershed Analysis: Live or Dead?
(from: Furniss 2001)

Live Watershed Analysis - As It Should Be -	**Dead Watershed Analysis - As It Sometimes Is -**
Science-based	Truth by assertion
Multiple scales, scale integrative	Single scale, not scale integrative
Interdisciplinary	Mono-disciplinary
Needed and effective inquiry	Doing what I like to do
Place-based	Actions-, proposals-, recommendations-based
Genuine learning	Shoring up one's position
Syn-ecological	Aut-ecological
Rates	States
Open, readily updated and revised	Onto the shelf. "Done"
Clean communication	Jargon-encrusted
Finds the holes, the critical uncertainties	Data bulking, nothing but knowns and givens
Seeking truth	Same old advocacy, spin, and worn-out, unexamined conclusions
Embracing complexity	Oversimplified
Active doubt	Dogma
Distilled meaning	Gobs of data
Multiple hypotheses	Single hypothesis, tightly held
Parallel, iterative	Strictly linear
Questions oriented	Methods oriented
Seeking results	Process obsessed
Teaching each other	Strutting our stuff
Adaptive, seeks to learn from failures	Static, ignores failures
Discerns patterns	Obsessed with details
Discovers that it's an elephant	"This is a fire hose, a brief case, a hat, a…"
Integrative	Reductionist
GIS is a tool	Obsessed with GIS
Welcomes and encourages critique	Critique is unwelcome and polarizes
Findings based on logic and backed by data	Data bulking with no logic trail between data and conclusions

C. Why Monitor?

Monitoring is just a tool, among many, to gather or generate data or information. The data or information must be used for some purpose by someone to be more that just a data point. The purpose might be to educate individuals in hopes they change their attitude, decisions and behaviors. Another purpose might be regulating human activity to prevent degradation, which can take many forms. It is simply a tool to produce data, that data must be transformed into information and delivered to make a difference.

Information can be powerful. Many folks rely on information as their power base. Others rely on suppression of information or information gathering processes, because without certain information we can continue in ignorance, until the next crises. This is a reactive mode. Information is just information; we perceive it as positive or negative, and in that judgment give information power. Information in absence of a judgment is just information. Sometimes, the judgment is not about the information itself but how the information is used. If we were just curious and unable to judge, we might crave information like kids crave candy, rather than be overwhelmed by it. Watershed assessments and monitoring programs do not magically produce information. They will always generate data, but it takes planning and forethought to make our watershed assessments information generating systems.

Without data we don't have information, but we need to ensure that the data we are collecting will produce the information we need. We need to focus; we don't need all the information in the world. We need specific information. That is why we plan, to focus and guide so we can evaluate and act.

Thus, monitoring is an essential component to generating information in watershed assessments. The watershed assessment design, not just the monitoring design, and the values of the people and the structure and function of the entities implementing the design that will turn monitoring results into effective information.

We could make decisions without monitoring, but how will we know the effect of those decisions? The price tag could be both positive and negative. If multiple individuals and entities did not study the effects of smoking (a form of monitoring) would we know today the cause and effect relationships associated with smoking? Do we know them with absolute certainty? No, and we may never, but we employ a combination of confidence intervals science provides and our own intuition to make personal decision (to smoke or not to smoke), institutional decisions (need to be 18 to purchase cigarettes) about smoking.

Not all data are equal. This is a more effective assumption than the converse, all data are equal. How do you determine if the monitoring data is *right*? The key lies in effective planning, that is how. Planning takes time. You will spend the time somewhere else, guaranteed, so you might as well plan for the desired endpoints now.

D. Why Involve Citizens?

Our state and federal agencies have shrinking budgets and staff with increasing expectations and needs from the public. These entities will never be able to collect everything, all the time everywhere. The demands on resources are not in harmony with supply. No entity can. We need all of us to take care of the ship. We need federal, state and local government, corporations, small business, non profits, youth middle age and the elderly. We each have a responsibility and a role. The EPA recognizes this in their nine recommended elements for states watershed assessment programs. Sometimes that means we work independently and other it calls for collaboration. A large percentage of the work calls for citizens to step up to the plate or it simple will not happen. What ever the plate is may be environmental, economic, social, health, education or transportation. We need to participate.

Regardless of who is conducting watershed assessment and monitoring, we suggest it should be done as scientifically sound as possible, inclusive of people, processes and mediums. Citizens are the essential component in the larger outcome of watershed protection and restoration. All other entities will spend their resources in a reactive mode by fixing, educating and problem solving. It is empowered citizen's that change systems to forward focus, pro-active versus reactive expenditure of resources.

E. Why Bother to Plan or Design?

Have you ever wondered if your monitoring is telling you what you want? If you are monitoring the appropriate variable or location? Frequency? Method? Why monitoring doesn't seem to be facilitating any change? Your monitoring seems like an effort for the sake of the effort? No one can tell you why you are doing what you are doing? Why your decision makers won't use your data? Or use it the way you want?

Without **carefully designing** a connection between all monitoring and assessment components, from identifying the purpose and use, to collecting and analyzing samples, turning data into information and delivering that information, it is difficult to measure success or failure. It is assumed that monitoring activities have this streamlined, well oiled connection between all the components. Often, and in most cases this is not true. Taking the time to plan a watershed assessment and associated monitoring activities may be the most important step in the assessment plan1.

Think of it this way: in 10 years someone will look at your water quality data and want to know how you came up with those numbers, those conclusions, and those recommendations, how will they know? This person should be able to find out by reading documentation about your monitoring and assessment plan. Besides providing documentation and a mechanism to communicate your plans, a study design serves some very important purposes for your group and to the people you hope will use your data.

- It forces you to focus on what you are trying to accomplish with your monitoring program;
- It prevents waste of time and money on equipment and procedures that are inappropriate for your group or goals;

- It allows you to select the most appropriate monitoring strategy to address the issues that are important to you and your community;
- It allows everyone who might use your data to assess the quality of your results since you clearly document your sampling and analysis methods and quality assurance procedures;
- It minimizes the impact of changing personnel on the continuity of your monitoring activities because anyone can read your study design and "pick up the threads;"
- It allows your group to re-evaluate your monitoring study every year in an orderly manner and make changes as needed; and,
- If you are using federal funds to monitor your waters, you will be required to prepare a "Quality Assurance Project Plan" (QAPP). You can very quickly and easily convert your study design document into a QAPP.2

F. Why This Framework?

There is plenty of monitoring design frameworks in the literature. Most of them focus on a specific data user (303(d) listing for example) or a specific data purpose (compliance or to determine existing conditions for example). Most of them start data acquisition with the assumption that the why is already fleshed out somewhere by someone, if they even ask at all. The other assumption is often made that someone other than the data acquisition team will do the assessment, analysis, reporting, decision making and evaluation. The focus is on the stuffing to the Oreo cookie, data acquisition and not the chocolate cracker gives the stuffing integrity.

Each sample or value reported is small subset of the possible values, or population. If we are going to make inferences about health, condition or quality of the larger body of water, over space or time, we will need to abstract general information from the data. Simple tables of results or colored maps will not suffice. We need more planning, better planning. We need carefully designed connections between monitoring reasons, data users, defining monitoring questions and what we plan to acquire. We need to define the end, what decision needs to be made and plan acquisition backwards from that information.

We want to create an assessment and monitoring system that is information rich not data poor. An effective monitoring system must have its components identified and defined in a way that they are all related to an overall information goal or the ultimate decisions that are desired. Existing monitoring programs often don't have these connections, not because the authors didn't think those components are unimportant or unnecessary, but because the front and back end of data acquisition is hard to plan, hard to implement and hard to connect fragmented functions or structures. Watershed assessment and monitoring is not black and white ready made science. In many organizations, the front and back end functions occur "somewhere" else. It is our premise that we can no longer afford to operate in a functional vacuum.

The front end of an effective monitoring plan includes allocating resources to planning period, but to conducting a holistic inventory, creating a vision, aligning programs and missions to that vision, defining desirable and measurable outcomes, identifying who will be the target of your work and

what their needs are, and defining monitoring uses, purposes and objectives. The back end of an effective monitoring plan includes planning for data management, analyses, interpretation, conclusions, reporting, action and evaluation.

This suggests that our focus is on the Oreo cookie as a whole, in both planning and implementation. The front and back end support the stuffing, make it whole, make it a cookie, and make it a product. We want our monitoring programs to be systems that produce added value products, that provide information and move us closer to our outcomes, mission and vision.

We need to create, operate and be accountable to an information system, not just a monitoring program, unit, section or event. We want to produce information for change, not just numbers. A functioning system, by definition, has inclusive and connected parts and is not fragmented. An effective system combines all its parts in so that structure and function are aligned and synergy is a result. Applied to watershed assessment and monitoring programs what we really want is an information system that it generates information for a targeted decision maker based upon their information needs and our need to influence them in a planned manner and thus evaluation is measurable. Our needs are derived from our vision, mission and desired outcomes. If monitoring programs are to be inclusive they need to also include designing and implementing data management, analyses, interpretation, conclusions, reporting and evaluation.

Our premise is not to reinvent the wheel that has already spun, nor is it to critique existing frameworks. We want to leverage the excellent work that does exist and add to it, help it become an information system. We are not suggestion the material and manner that is presented here is the catch all end all either. We are suggestion that most watershed assessment monitoring programs, large and small, public and private, short term or long term, chemical or biological, water chemistry or land use changes, should have a holistic, inclusive design, whatever that framework and design might look like, the basic questions are the same.

Without a framework, plan or design, we concur that the resources are expended anyhow, just further down the process and out of context. Planning, designing, answering tough questions, doing research, establishing relationships and communicating takes time, absolutely. The amount of time, resources and rigor spent on each design will be specific to each situation, but there is a framework and design. We concur that if you charge ahead without some version of planning; you gamble in reaching your endpoint and may not even know what your endpoint is. Like shooting squirrels in the dark, you may hit your target, but it wasn't because of the design. You may hit a squirrel and not even know it. We need to be accountable to our life energy, to the resources members and constituencies entrust us and plan to use them wisely.

In 2002 the EPA recently proposed and are required all state's to address nine elements in their watershed monitoring and assessment programs. While a statewide scope may not apply to your work, there are some relevant considerations for any scale assessment and monitoring program. We might glean our data users or data purposes from this list. We might glean questions and elements we

can tweak and apply to our own programs. For more detail on the nine elements see **Overview Resource Guide**, the ten elements include:

1. **Monitoring Program Strategy**

   Strategies must serve all water quality decision making processes, be long term, identifies technical needs, how the elements in the strategy will be achieved and be collaborative with others state agencies, volunteer organizations, academia, etc.

2. **Monitoring Objectives (Questions)**

   That serve water quality decision making processes including the CWA but not exclusive, such as status lists 05(b) and 303(d), 319 Non point source, 314 Lakes, 401 certification, as well as address the overall questions of overall quality of state waters, extent of changes, identify problem areas and areas needing protection, level of protection, and how effective are the restoration and protection programs.

3. **Monitoring Design**

   The approach and rationale for selection of sample design that best serves the monitoring objectives, are scientifically defendable, for states this means integrating several sampling designs, and can answer the questions asked in the water quality decision making process by decision makers.

4. **Core and Supplemental Water Quality Indicators**

   EPA suggests a tiered approach that employs a core set of baseline indicators used at all sties and then adding applicable design elements and indicators for site specific or project specific decision criteria, these would be supplemental indicators. The Overview Resource Guide has a table of water quality indicators recommended for different designated use categories.

5. **Quality Assurance**

   Quality assurance and control measures are identified and documented. These are the measures that identify the level of quality for the data and how that quality will be achieved during collection and analyses. EPA recommends their format in the Quality Assurance Project Plan, available at http://www.epa.gov/quality/. They also suggest these plans be peer reviewed.

6. **Data Management**

   They recommend the states use the structure and function that STORET provides to store and retrieve data and associated meta-data, http://www.epa.gov/storet/. They also request that the State's store the results of the assessments in an electronic format and provide a guidance to do so, called the Integrated Water Quality Monitoring and Assessment Report Guidance , which is updated every year or so, www.epa.gov/owow/tmdl/2002wqma.html .

7. **Data Analyses/Assessment**

   Each state has a methodology for assessing attainment of water quality standards based on analyses of various types of data from various sources, for all water body types and all State waters. The method should document how data will be compiled and analyzed to make attainment decisions, include source of data, reference requirements and procedures and data analyses procedures.

8. **Reporting**

The CWA requires States to produce certain reports and lists, such as the 305(b), 314, 303(d), and 406. The state is encouraged to report to the public on water quality taking into account the needs of interested audiences.

9. **Programmatic Evaluation**

   Periodic reviews of the monitoring program to determine how well it serves its water quality decision needs for all State waters is required. This evaluation includes listing limitations.

10. **General Support and Infrastructure Planning**

    States will identify current and future monitoring resources to fully implement is monitoring and assessment strategy as part of an ongoing integrated planning process. This includes resources for staffing, training, funding, field/laboratory, data management and reporting functions.

The approach of this workbook provides a framework that addresses all nine elements. If the monitoring reason or decision end point is not assessing water body condition, this is still relevant in that many aspects of this type of assessment serve other assessment types. The approach in this workbook framework is inclusive and can be applied to all media including, physical, chemical, biological and human. The framework can apply to any ecosystem including streams, lakes and wetlands as well as forests, rangeland and deserts.

This framework does not provide every answer for every monitoring reason. What this framework is intended to provide is an approach or a way of thinking and planning that is common to all assessment and monitoring projects, that is, if what you want is an information generating system that provides the information you want and need. How to document and integrate multiple monitoring and assessment projects within your organization and watershed is also included. The point is if not this work book framework, then choose one, create one, but have one.

G. Planning Versus Implementation

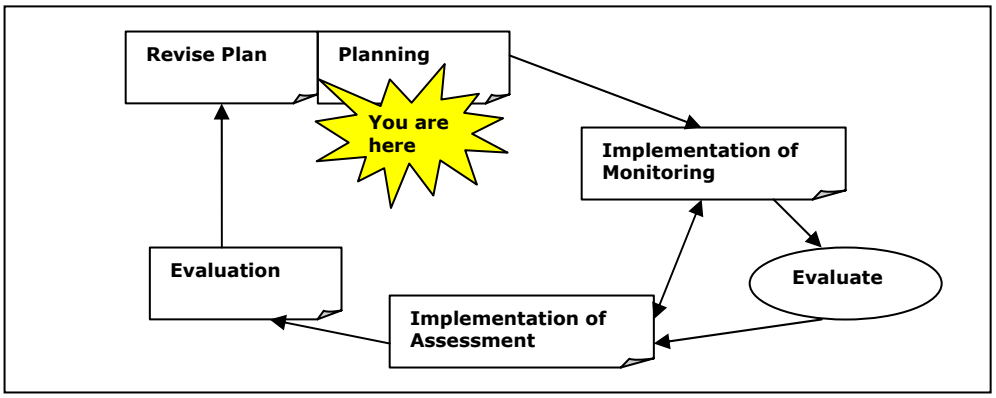
As you plan your monitoring and assessment activities, projects or program you will begin to appreciate the fine dance between planning and implementation. Designing each component, element or step of the actual plan is itself a process. You could call designing each component of the plan as a micro-process in the bigger context of implementing the entire monitoring and assessment activity. Planning itself is then a process, one which is not linear, it takes time (even years), is iterative and dynamic and really never complete.

Planning is always presented in a linear fashion due to the limitations of the page, as if it was a straightforward clean process. Any presentation of a framework appears linear; this work book is no different. We acknowledge that the process of designing and planning your framework is not linear, but iterative. We have designed this workbook to meet entities where they are in the process of planning and implementation, you may start anywhere, move forward and backwards, skip and spend as much time and rigor at each step that is appropriate. Training can help because it can incorporate the iterative nature of planning, which is why we including training material and actively fund raise to help train leaders and service providers.

For example, if you want to create a watershed vision or reconnect with an existing vision, you will engage in a visioning process. The desire to create a watershed vision is the motivation or a purpose. The plan to create a watershed vision might include, identifying who should be part of it, what activities will you do such as brainstorm, partner and illustrate a watershed, share, prioritize and select. Implementation would be the process of conducting and completing all parts of the plan. The result of implementing the plan and associated elements would be a watershed vision.

It is very easy while in the midst of designing a component or part of the plan, to get sucked into that component and begin implementing. This may be in part because you may begin implementation of a particular component of the plan, or already have a component being implemented that you are evaluated and re-designing. Thus, it is not really about not straying, you will, it is more about remembering and coming back to planning. We would encourage you to train your mind to remember a plan is what you say you will do and why, implementation is the doing of all plan parts and evaluation is answer the question did I get the results I wanted, if not why? Then re-design the plan and re-implement.

Figure 1. Planning Versus Implementation, these workbooks plan all the other processes



These guidance modules are designed to help you produce a holistic and effective watershed monitoring and assessment plan. This plan will be dynamic and organic. The products of this process are not singular. You will produce an over all documented plan as well as several micro-sub-plans. The primary monitoring and assessment plan will a plan that you or someone will be able to implement with existing resources and then evaluate, see Figure 3 for an illustration of potential products.

You will plan who is the customer of the data that will be generated by monitoring and assessment. We call these the information needs of targeted decision makers (uses/users) and monitoring questions (questions/purpose). These information needs are the foundation for your sampling plan or design, what, when, where, how and the quality of data to be generated. These information needs are also the foundation for how data will transform into information through analyses, interpretation, reporting and delivery to decision makers and evaluation. Information needs also provide the needs to design a data management system that will store raw data and turn that data into information. All of this is in the *plan*.

Once the plan is complete, then implementation can begin. You begin the process of visioning, inventory, research, gathering data, building data management, analyses, interpretation, reporting, data delivery and evaluation. Then you re-plan.

It is possible and sometimes necessary to implement without a plan. This should be minimized for maximum expenditure of resources and effectiveness and avoid reactive and crises management. We all have had the experience of planning and implementing at the same time and we acknowledge that it can seem a bit schizophrenic. The way out of that space is to make a commitment to continue to plan. It is our ability to evaluation and measure success that will provide sustainability and progress toward our watershed vision or outcomes. The ability to measure success is directly correlated to the degree and detail we successfully plan, not how much we "do" , how data we collect, or staying in the implementation circle, always doing, never asking if it is making a difference, never identify or planning the why, who and endpoint.

H. Overall Workbook Components, Content, Organization and User Tips

1. Components available with these workbooks include:

- Four work books, one for each Phase, which includes this Overview of all four phases, an introduction to that specific phase, the step contents and worksheets within that phase and a phase summary or closure. Components for each work book include then:
  - Overview (purpose, how to use, of work book content, self assessment/evaluation, final monitoring and assessment outline and action plan outline, contact information)
  - Phase introduction and summary (four Phases)
  - Steps to complete with worksheets and instructions (18 Steps within the four Phases), including a self assessment of that step, action plan and products to put in an overall M & A document or plan, references and resources attached.
  - Phase summary and closure
- Rocky Mountain States Implementation of the Clean Water Act (CWA), summaries for each of the Rocky Mountain States, highlighting relevant monitoring and assessment information that can be used to design an M & A plan or compare the CWA between states. Even if the CWA is not the targeted decision maker end point, many of the monitoring and assessment processes, indicators, criteria and tools for example are valuable for other decision makers.

- Training Material including a leader/participant agenda, self assessment tool, tips for training and PowerPoint slides per Phase Work Book.

Workbook components are available in several formats, printed and bound hard copy with CD, printed and unbound with CD, CD only or on the Rocky Mountain Watershed Network Website, www.rmwn.org as PDF files. Worksheets and text can be requested in a word format to ease customization on the website.

2. Four Phases and 18 Steps Content (presented as linear but iterative behavior)

Phase 1 People Design (Build the Foundation) Workbook

Step 1: Share Watershed Vision and Desired Outcomes (Results)

What will/should your watershed look like, identifiable outcomes or results indicating the vision has been achieved, possible outputs or M & A activities and target audiences to achieve results, identify common ground between vision and organizational values.

Step 2: Scope Inventory (Physical, People and Information)

Based on desired M & A activities/audiences, identify watershed, water bodies, basic science, discover existing information on physical characteristics, status, stressors, cultural, historical, power and existing data, information, resources and M & A activities that align with yours, identify gaps and needs, develop Master Inventory List and Needs Plan.

Step 3: Identify Monitoring Reason(s) and Data Use(s) (Assessment Type)

Choose an Assessment Type(s) which are a combination of monitoring reasons and data uses in order to meet desired outcomes/results. Rest of the planning is per each Assessment Type.

Step 4: Develop Monitoring Questions (Refinement of Monitoring Reasons)

For each Assessment Type, combination of monitoring reason and data use, identify specific questions that will be answered by generating data or monitoring activities. Rest of planning is per Monitoring Question.

Step 5: Target Decision Makers and Info Needs (Refinement of Data Uses)

Strategic effort to select appropriate decisions makers and identify or develop the information needed for them to make desired decision, and thus achieve our outcomes/results, includes data quality objectives, pathway that data will travel to transform into information and be delivered to target decision maker.

Step 6: Summarize with an Information Blue Print –Data Pathway Fact Sheet

Summary and communication tool for each monitoring question per Assessment Type of how you plan to plan to generate data, transform into information and deliver to a targeted audience to meet their information needs and answer the monitoring question, and achieve desired M & A outcomes. The culmination of Information Blue Prints per Assessment Type provides the foundation for Phase 2, the technical sample design or plan to generate data.

Phase 2 Technical Design (Generate Data) Workbook

Step 7: What Will You Monitor?

Determine **what** needs to be monitored based on Assessment Type, or monitoring reason/monitoring questions and data use/targeted decision maker and their information needs (indicators, benchmarks, etc.), Phase 1.

Step 8: When Will You Monitor?

Determine **when** monitoring should occur based on Assessment Type, or monitoring reason/monitoring questions and data use/targeted decision maker and their information needs (indicators, benchmarks, etc.), Phase 1.

Step 9: Where Will You Monitor?

Determine **where** monitored should occur based on Assessment Type, or monitoring reason/monitoring questions and data use/targeted decision maker and their information needs (indicators, benchmarks, etc.), Phase 1.

Step 10: (W)How Will You Monitor to Meet Data Quality Objectives?

Determine **how** or methods to employ based on Assessment Type, or monitoring reason/monitoring questions and data use/targeted decision maker and their information needs (indicators, benchmarks, etc.), Phase 1. Includes data quality objectives, quality assurance and control measures.

Step 11: Management of Raw Data, Data Management Plan Part 1

How will you plan to manage the raw numbers and information generated by monitoring activities, including critical data management system support decisions? Gap Analyses.

Phase 3 Information Design (Turn Data into Information) Workbook

Step 12: Data Summary and Analysis

How will you plan to analyze and interpret the numbers and information generated by monitoring activities, based on People and Technical Design? Define the starting point knowing it will evolve.

Step 13: Interpretation, Conclusions and Recommendations

How will you plan to make recommendations and take action from the interpretations and conclusions generated by monitoring activities, based on People and Technical Design? Define the starting point knowing it will evolve.

Step 14: Communication and Delivery

How will you plan to report or communicate the results to the target decision-makers, based on People and Technical Design? Define the starting point knowing it will evolve. There are multiple "off ramps" to deliver data, could be raw data, analyzed, interpreted, or interpreted with recommendations.

Step 15: Management to Generate Information (Data Management Plan Part 2)

How will you plan to manage the raw data through the functions of analyses, interpretation, and reporting and data delivery to target decision makers, including support system decisions? Gap Analyses.

Phase 4 Evaluate Design (Measure Success) Workbook

Step 16: Who Will Do What (Task Identification?)

Who will be implementing and accountable to all aspects of the monitoring and assessment plan and products, what is the communication structure?

Step 17: Evaluation of Effectiveness (of Plan and Implementation)

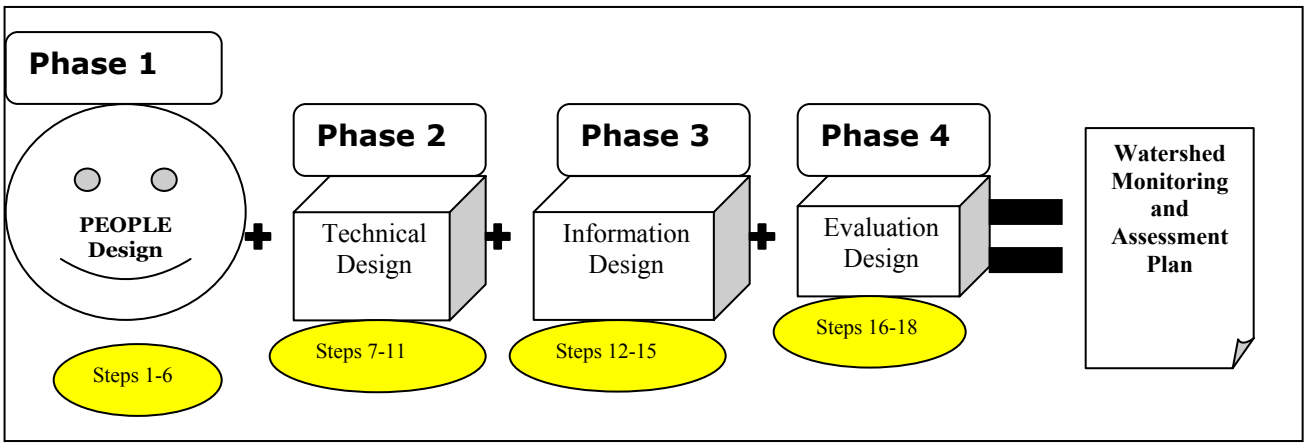
First, evaluation of a plan against organizational mission, resources and values. Evaluate the costs and needs, adjust and or document a plan to fulfill identified needs. Next identify overlap between multiple organization M & A activities and/or other watershed M&A activities primarily to look for efficiencies, collaboration and credibility. Next, evaluation of each element in the plan and of the overall design once implementation begins.

Step 18: Documentation and Communication (of Monitoring and Assessment Plans)

Documentation of M & A Design, that communicates, desired outcomes of M & A activities, monitoring reason(s), monitoring questions, data use(s), targeted users and information needs, and how those needs will be met through technical design/data generation, information design and how the design and implementation will be evaluated and updated. Tips to consider peer review of design or to incorporate in implementation.

The idea is that a holistic and effective monitoring and assessment plan needs the to identify the people, their purpose and associated information needs, or a well thought conceptual version of "why" M & A in order to plan and implement a technical and data-to-information design that can be evaluated and actually achieve identifiable outcomes/results. Figure 2 illustrates this.

Figure 2. Monitoring and Assessment Planning illustrated in Four Phases, 18 Steps.



3. Content within Each Step, Designed to Transfer Information into a Product

Each step contains information as headers in this format:

- Phase Illustration
- Step Illustration
- What this step is designed to accomplish
- Why complete this step
- Products if complete, product illustration
- What need to have completed before this step
- Where are you in big picture illustration (all Phases and Steps)
- Basic tasks (Actions and Worksheets)
- List of Worksheets
- Worksheets and Instructions to complete
- Background/Content to Assist in Basic Task (action/worksheet) Completion
- Case Studies (in progress)
- References
- Resource List (what is provided in Resource Attachment)
- Resource Attachment

4. Basic Tasks Actions and Worksheets

Each Step provides a list of basic tasks (actions and worksheets), worksheets and instructions that if completed would produce the products listed for that step. Basic Tasks might include an action other than completing a worksheet; these are identified with an "A" icon. Basic tasks that have an associated worksheet have a "worksheet" icon. These worksheets are a starting point and the content builds from one step to the next and one Phase to the next, requiring the movement of results from one basic task to the next. This may seem redundant, especially if completing these worksheets by hand. Worksheets are provided in word document here for ease of reproducibility and editing versus as linked spreadsheets for example. We encourage you to customize these and reproduced them in an electronic format, in Microsoft Excel© l for example, where it is easy to move information from one area to another by cutting and pasting.

 = Action Item

 = Worksheet

Basic Tasks for each step are numbered in sequence. For example, Phase 1, Step 4, Basic Tasks would be numbered 4.1, 4.2, and 4.3. Worksheets are numbered to correlate to each Basic Task and in sequence using letters. Thus, worksheets for Basic Task 4.1 would be 4.1.a and 4.1.b. In theory worksheet *a* needs to be completed before worksheet *b*.

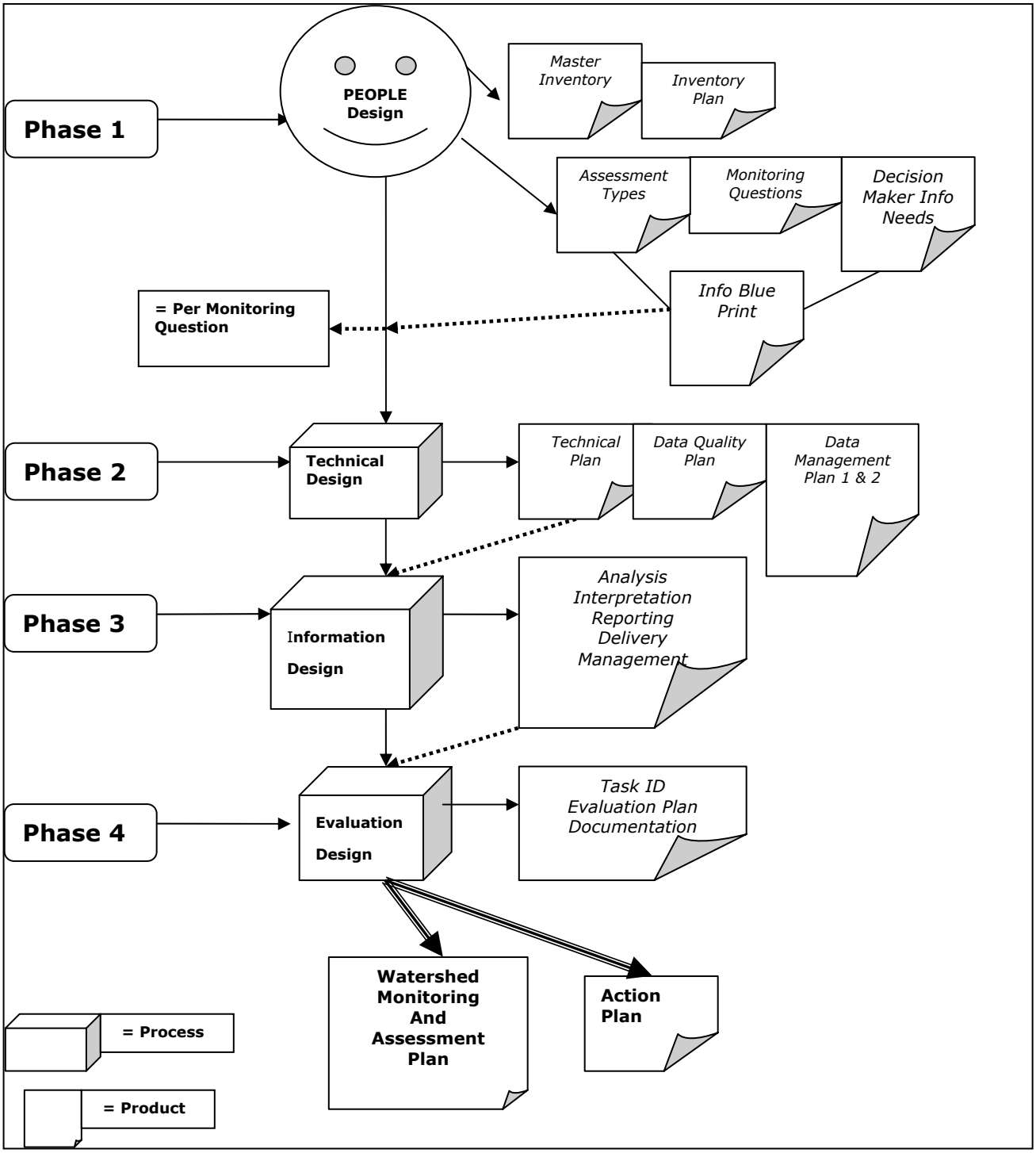
The *first* and *last* Basic Steps per Step are identical. The *first* three Basic Tasks are to 1) to identify should be involved with planning this step; 2) conduct a self evaluation of where you are with this step and what your needs are to complete this step; and 3) determine what needs to be completed before this step. The purpose behind number one is to involve the proper individuals at the proper time; the folks who might be involved in the planning may or may not be the same as those implementing the plan. The purpose behind number 2 is to recognize what you have done to date and incorporate that into the plan as well as identify areas for capacity building. The purpose behind number 3 is to provide a common starting point between groups that did complete previous steps and those that did not.

The *last* three identical Basic Tasks in all Steps include updating 1) any relevant sub documents or plans you might have created from this workbook such as an Master Inventory List, Inventory Plan, Data Management Plan, Quality Assurance and Control Plan your action plan, 2) what we call the "Action Plan" or the master plan that identifies the gaps, resources and needs necessary to fully implement this monitoring and assessment plan; and 3) The final Monitoring and Assessment Plan.

To address the continuum of reader experience, comfort, knowledge and skill we have provided content and background, examples, references and resources. The background and content follow the Basic Tasks. If a user desires more information or depth, they can refer to the references and resource attachments. Case Studies are being documented and developed based on groups within the region and are intended to be real not fictitious.

If all Phases and Steps in combination were completed at the appropriate amount of time and rigor for your organization, you would produce have a final Monitoring and Assessment plan, an action plan to build capacity for the M & A activities and numerous sub-plans. Figure 3 illustrates the possible products from these workbooks. Figure 4 provides an illustration for each Phase and Step.

Figure 3. Products of this workbook framework, products are on the right in the flip paper box



5. Rocky Mountain States Implementation of the Clean Water Act

The purpose of this Module is to highlight and summarize for each state the specific Clean Water Act information that might be necessary for watershed monitoring and assessment planning. Even if your monitoring reason is not directly CWA decision processes, many of the methods, sample designs, analytical methods can help design other monitoring reasons. In addition, if your monitoring reason is the same as CWA decision processes but your decision maker is not the regulators of the CWA process, you can still use their methods and science for your own purpose or decision makers.

It is helpful to understand how your state implements your CWA period. It is also useful to understand how other states implement their CWA relative to your state, especially states who receive water from adjacent states with different standards and the like.
We have divided the CWA information into three sections. Each state, CO, WY, UT, MT, NM, SD and ND are covered in each section alphabetically. In addition, for content that was cut/paste from the document, the map to the web site is provided so you can get the most current information. The three sections and content are:

Introduction

Section 1 - Clean Water Act Summaries for Each State alphabetically

I. DWQ and State Review Process
II. Contacts
III. List of Designation Uses **(Appendix A)**
IV. Water Quality Classified Uses and Antidegradation Policy ***(Section 2)***
V. Basic Standards / Criteria **(Appendix B)**
VI. Assessment Protocols used to Determine Standards
VII. Stream Segmentation System **(Appendix C & F)**
VIII. Treatment of the Water Column
IX. Treatment of Physical Habitat
X. Treatment of Sediment **(Appendix D)**
XI. Treatment of Biological **(Appendix E)**
XII. Treatment of Wetlands ***(Section 3)***
XIII. 305(b) Report
XIV. 303(d) List(s) **(Appendix G)**
XV. Assessment Protocols for listing and delisting impaired streams/segments **(Appendix H)**
XVI. Assessment for National Point Source Discharge Elimination System (NPDES) Permit
XVII. Glossary by State
XVIII. Appendix Map (relevant websites for CWA resources and appendices)
XIX. Appendices A through F provide examples cut/paste from the State's website for and the webpage map to get to the site for:
    A. Designated Uses
    B. Basic Standards and Treatment of Water Column

C. Stream and Waterbody Segmentation/Classification
D. Treatment of Sediment
E. Treatment of Biological
F. Naming Conventions
G. 303(d) page example
H. Assessment of impaired waters

Section 2 -Water Quality Classified Uses and Antidegradation for Each State Alphabetically

I. Antidegradation Policy Contacts
II. Antidegradation Policy
III. Implementation Procedures
IV. Water Designation Lists
V. Latest Antidegradation News

Section 3 - Treatment of Wetlands for Each State Alphabetically

I. Summary
II. Water Quality Standards
III. Wetland Definitions
IV. Wetland Classifications
V. Biocriteria Standards
VI. Sources Consulted

Resources

6. Training Package

The workbook has a training package for those who might need to conduct either local watershed training or a service provider training. These training tools are designed to be a starting point and be modified to meet your needs. Training Package is included in each Phase Workbook, as is this Overview. Training Package content includes:

I. How to Use Contents of Training Package (this document)

II. Training Model, Assumptions and Tips (this document), attached in PDF format are example training flyer, registration form, scholarship form, match documentation form.

III. Training Agendas (description only this document /on CD)

A. Local Watershed Progressive Training Leadership (Word document Localleadershipagenda05.doc)

B. Local Watershed Progressive Beginner Program (Word document localbeginneragenda05.doc)

C. Local Watershed Progressive Existing Program (Word document localexistingagenda05.doc)

D. Service Provider, five day Training Leadership (Word document SPleaderagenda05.doc)

E. Service Provider, five day Participant (Work document SPparticipantagenda05.doc)

IV. Pre-Evaluation and Training Evaluation Tools (description only this document / on CD)

A. Screening Tool for Local Watershed Training (Word document localscreensurvey05.doc)

B. Pre-Evaluation Tool for Local Watershed Training (Word document localpreevaluation05.doc)

C. Session Local Watershed Training Evaluation Tool (Microsoft Publisher localworkshopevaluation05.pub)

D. Overall Watershed Training Evaluation Tool (Microsoft Publisher localoverallevaluation05.pub)

E. Pre-Evaluation Tool for Service Provider Training, modify the screening tool for local watershed training if need a screening survey. (Word document SPpreevaluation05.doc)

F. Service Provider Training Evaluation Tool, combine and modify C and D to fit Service Provider Training.

V. Slide presentations to assist with Workbook Phases (description only this document / on CD) All shows in Microsoft Power Point.

A. Overview and reasons to plan monitoring and assessment (Microsoft Power Point Whyplan05.ppt)

B. Phase 1, Steps 1-6, People Design – Build the Foundation
- Phase1Step1.ppt (Watershed Vision, outcomes)
- Phase1Step2.ppt (Scope Inventory)
- Phase1Step3.ppt (Assessment Type-monitoring reason + data use)
- Phase1Step4.ppt (monitoring questions)
- Phase1Step5.ppt (target decision makers / information needs)
- Phase1Step6.ppt (summarize Info Blue Print – Data Pathway Fact Sheet)

C. Phase 2, Steps 7-11, Technical Design – Technical Foundation
- Phase2Step7.ppt (what)
- Phase2Step8.ppt (when)
- Phase3Step9.ppt (where)
- Phase4Step10.ppt (how meet data quality objectives)
- Phase5Step11.ppt (data management of raw data)

D. Phase 3, Steps 12-15, Information Design – Turn Data into Information
   - Phase3Step12.ppt (data summary and analysis)
   - Phase3Step13.ppt (interpretation, conclusion and recommendation)
   - Phase3Step14.ppt (communication and delivery)
   - Phase3Step15.ppt (data management to generate information)

E. Phase 4, Steps 16-18, Evaluation Design – Measure Success
   - Phase4Step16.ppt (Task Identification)
   - Phase4Step17.ppt (Evaluation of Effectiveness)
   - Phase4Step18.ppt (Communication and Documentation of Plan)

7. Perspective: Watershed Group, Service Provider or other?

Below in Section 8, we define a watershed group and service provider. Regardless, the audience for this workbook maybe concerned with a broad variety of problems or threats to many different watershed values. The scope and level of any watershed monitoring and assessment plan will vary greatly depending upon factors such as the complexity of the group's goals, the capacity of the group to create and carry out the plan, community view points, resources and others. One size does not fit all; each situation presents its own problems and situations. We hope the workbook provides a starting point, not necessarily all the answers, but the framework to figure out what to ask.

These work books are intended for anyone's use. We tried to identify the lowest common denominator regarding experience and background of practitioners conducting monitoring and assessment activities. Higher levels of experience, background and knowledge do not by themselves guarantee that planning will happen. These workbooks are designed to produce a scientifically defensible monitoring and assessment plan, if you put the time and effort into the plan. These work books are also designed from the practitioner's point of view, not a service provider's point of view. Our philosophy is a service provider needs to have enough experience in the doing in order to teach or train, thus the content in the steps could be modified to be in a train-the-trainer format or be used to train Service Providers.

8. How to Use or Starting Point

Workbooks work best if accompanied by a hands-on training. However, these are designed to be used in absence of a hands-on training. You can start at any step provided you answer the minimum questions needed to get through that step. You can skip any step, assuming you have rationale to do so. If you have the products from the step and they are relevant and useful, skip the step. If you know how to do the step, don't worry about our basic tasks, worksheets and back/ground content, do it your own way. You can spend as much time and resources on each step that are appropriate to your work and organization. The point is start…..and finish.

You need to decide who is essential, important and or desirable to assist with this plan. Keep in mind that the planners may not be the implementers or the where the information ends up. The most effective plans involve all entities in the planning stage at an appropriate level and time. Someone needs to take responsibility for being keepers of the planning process and communicating how decisions will be made.

These workbooks make some assumptions, such as you have gathered an interested committed nucleus individuals or entities willing to plan and implement watershed monitoring and assessment.

This nucleus group probably already has expectations of their water body of interest or watershed and how it is and desirable changes. They may even have ideas for action. You are all ready to put

forth some energy to make change and this planning effort is here to help guide and evaluate that effort.

For these workbooks the following terminology is used:

Watershed group
: Any group, formal or informal, gathered within a defined (by them) watershed boundary, can be citizen based, governmental based or mix, can be large or small, etc. Watershed groups may be concerned with a wide variety of problems or threats, implementing a wide variety of activities serving a diverse set of audiences, range in watershed values, capacity and longevity.

Service Provider
: Any individual or entity that provides products or services to individuals or groups on the ground, working in a watershed conducting or planning to conduct monitoring or assessment activities

Stakeholder
: Any individual or entity that has a "stake" in whatever you are doing, be it planning, implementing or individual components of each of those larger processes.

Assessment Type
: A combination of a specific monitoring reason and specific data use

Monitoring Reason
: The reason/purpose for which data is being collected or existing data is gathered, for example trend, condition or effectiveness investigations

Monitoring Question
: The specific set of questions monitoring activity is suppose to answer for each combination of monitoring reason and data use, a refinement of purpose

Data Use
: The intended use for the data being collected or existing data is gathered, for example a watershed association, the state department of health, the specific decision maker or target audience trying to influence, refinement of use into user or decision maker

Decision Maker
: Any target audience you want to influence, for example, ranging from trying to increase awareness, skill, and behavior to change standards or regulations to protect or restore to actual restoration activities.

Data Pathway
: The path that data generated will travel from being collected, validated, analyzed, interpreted, and delivered to the target decision makers for a specified decision to evaluate.

Data Quality Objectives
: Quantifiable endpoints that help define how "good" the data needs to be for specific decisions, including acceptable level of error, especially if doing up/downstream, pre/post assessment types, methods, detection and reporting limits, defines level of precision, accuracy, reproducibility and comparability as targets to meet.

Quality Assurance
: Documented procedures, methods, and processes that will ensure the data quality objectives ore met, helps assess precision, accuracy, reproducibility and comparability. .

Data Quality Objectives
: Documented procedures and sample that ensure if data quality objectives will be met, such as blanks, duplicates, spikes, helps assess precision, accuracy, reproducibility and comparability.

I. Outlines for Phase/Steps, Self Assessment, Watershed Monitoring and Assessment Plan and, Action Plan

The following outlines are included in the overview for you to see where you are headed, the bigger picture. They are tools we are using within each step that when complete will produce the content for these outlines. They are also provided here if you need them in their entirety to edit or use as electronic starting points for the worksheets.

- One page Four Phase, 18 Step Outline and Illustration (Figure 4), Product Illustration (Figure 3)
- Self Assessment Outline
- Action Plan Outline and Final Summary Plan Outline
- Monitoring and Assessment Plan Outline

One Page, Four Phases, 18 Step Outline

Watershed Monitoring and Assessment *Design* Workbook

Plan an Information Rich System (not Data Poor)

Phase 1 People Design (Build the Foundation)

Step 1 - Share Watershed Vision and Desired Outcomes (Results)
Step 2 – Scope Inventory (Physical, People and Information)
Step 3 – Identify Monitoring Reason(s) and Data Use(s) (Assessment Type)
Step 4 – Develop Monitoring Questions (Refinement of Monitoring Reason)
Step 5 – Target Decision Makers and Information Needs (Refinement of Data Use)
Step 6 – Summarize with an Information Blue Print-Data Pathway Fact Sheet

Phase 2 Technical Design (Generate Data)

Step 7 – What will you monitor?
Step 8 – When will you monitor?
Step 9 – Where will you monitor?
Step 10 – (W)how will you monitor to meet Data Quality Objectives?
Step 11 – Management of Raw Data (Data Management Plan Part 1)

Phase 3 Information Design (Turn Data Into Information)

Step 12 – Data Summary and Analysis
Step 13 – Interpretation, Conclusions and Recommendations
Step 14 – Communication and Delivery
Step 15 – Management to Generate Information (Data Management Plan Part 2)

Phase 4 Evaluation Design (Measure Success)

Step 16 – Who Will Do What? (Task Identification)
Step 17 – Evaluation of Effectiveness (of Plan and Implementation)
Step 18 – Documentation and Communication (of Monitoring and Assessment Plans)

Figure 4. Four Phases, 18 Steps Workbook Illustration

1. Self Assessment Outline (Tool)

The Self Assessment tool is used to evaluate or assess the status of your monitoring and assessment plan and associated sub products and processes prior to completion of these workbooks or individual steps. The purpose of this activity is to acknowledge, document, evaluate and incorporate what you have at this point into a plan and identify your focus areas regarding that specific step and goals. It is not intended to complete in one sitting, but as part of a discovery process completing each step. It is probably overwhelming for most entities to complete in one sitting.

The second Basic Task in each Step is to assess the status of that specific Step for your organization or existing M & A activities before you complete the step. Once you complete the step, one of the last Basic Steps has you evaluate if you need any other resources or products in order to complete this step or products to your satisfaction. If you identify a need, then the Basic Task is to document those needs in an overall action plan (see Action Plan outline). The outline below is the assessment for all Steps. Within each Step the appropriate questions are pulled from this overall assessment into each Step.

Monitoring and Assessment Self Assessment Tool Instructions.

You can complete the entire assessment in one sitting, however it is not recommended. You will complete it as a subset of each Phase/Step. Complete the following table as best you can. Edit the table to match your Monitoring and Assessment Design Components or provide you own assessment tool. This activity will provide valuable connections between what you have been doing, are doing and want to do, it that is important. If it is not, then skip. Employ as much rigor and effort in this activity as you want to get out of it.

Each Section on this Self Assessment correlates to a Phase and Step in a progressive manner as if it was all completed linearly. Evaluate each item or category for existence, documentation, use and effectiveness. It is helpful to copy this into your own word document, change view to landscape and paper to legal, more information can be provided.

1. **Identify and clarify the item to your program. If you do not understand what the item is referring to, try looking in that workbook, Phase, Step.**

2. **Determine if you "have" or "don't have" the item, mark the appropriate box. If you don't have it and determine you don't need it, explain why in the comments document. You may not need to know but perhaps your target decision makers, board or membership might want to know.**

3. **If you have the item "documented", mark that box. If so, list in the comments where, hard copy, chapter in a document, electronic file name and location, etc. The assumption is you value the ultimate goal to document and communicate your M & A plan, activities and results.**

4. **If you have the item, assess the use of it, use the scale below or provide your own answer and comments.**

   Rating Scale for USE:

   0=doesn't exist so use is nil
   1=don't know why would need or understand item
   2=exists, don't know where it is, if it is used, etc. so use is essentially nil
   3=exists and use some of time
   4=exists and use all the time
   5=wish it existed, would use it lots

5. **If you have the item, assess the effectiveness of it, just because something exists or is used does not mean it is effective in its use, use the effectiveness scale below or provide your own answer and comments.**

   Rating Scale for EFFECTIVENESS, assumes material exists:

   0=not effective or functional at all
   1=incomplete (all elements are not there) and some existing parts need revising
   2=incomplete but what is there is okay
   3=complete (all elements are there), some parts okay but need revising
   4=complete and effective

6. **If completing entire assessment in one sitting or independent of this workbook, evaluate gaps, needs and develop an action plan. If completing as part of the work book, the action plan Basic Step will instruct you within each step.**

Item	Have	Don't Have	DOC	Assessment of Use (Scale 0-5)	Assessment of value / effectiveness (Scale 0-4)	Comments/Notes
1. Written Vision Statement for future of watershed conditions (or for your assessment)						**Phase 1 Step 1**
2. Outcomes that are measurable or would indicate directly or indirectly the success of the vision						**Phase 1 Step 1**
3. Written Organizational Mission Statement						**Phase 1 Step 1**
4. Organizational values						**Phase 1 Step 1**
5. Physical inventory Tier 1, defined geographic scope your are working in, List of water bodies of interest (rivers, lakes or wetlands),						**Phase 1 Step 2**
6. Maps of watershed, area of interest, other? (draw a map if need to)						**Phase 1 Step 2**
7. Physical Inventory Tier 2, features, biological, etc. for water bodies						**Phase 1 Step 2**
8. Physical Inventory Tier 3, status and condition of water bodies						**Phase 1 Step 2**
9. For water bodies of concern, evaluation of status or condition, by self, locals, DEQ, other						**Phase 1 Step 2**
10. For water bodies of concern threats identified areas needing protection identified						**Phase 1 Step 2**
11. People Inventory Tier 1, cultural, historical						**Phase 1 Step 2**

Item	Have	Don't Have	DOC	Assessment of Use (Scale 0-5)	Assessment of value / effectiveness (Scale 0-4)	Comments/Notes
12. People Inventory Tier 2, People, power and relationships						**Phase 1 Step 2**
13. People Inventory Tier 3, Information, existing data/collection efforts						**Phase 1 Step 2**
14. Inventory of reports or significant documents in your scope of interest						**Phase 1 Step 2**
15. Identified existing data could use and have completed data quality review of it						**Phase 1, Step 2**
16. Assessment Types, combinations of monitoring reasons and data uses to meet outcomes						**Phase 1 Step 3**
17. Identified, written, specific monitoring questions for each Assessment Type						**Phase 1 Step 4**
18. List of targeted decision-makers						**Phase 1 Step 5**
19. For targeted decision-makers, knowledge of what information they need, see list in Phase 1, Step 5						**Phase 1 Step 5**
20. For targeted decision makers identified data quality objectives?						**Phase 1 Step 5**
21. For each monitoring question, identified data pathway(s) (path for monitoring results to a final decision, decision-maker)						**Phase 1 Step 6**
22. List of ambiguous terms defined such as healthy, significant, restored, quality, etc.						**Phase 1 Step 6**

Item	Have	Don't Have	DOC	Assessment of Use (Scale 0-5)	Assessment of value / effectiveness (Scale 0-4)	Comments/Notes
23. Written Technical/sample or monitoring Plans, includes overall monitoring goals-what, when, where, how						**Phase 2 all Steps or Phase 1 Step 5**
24. Identification of what, indicators, parameters, benchmarks, etc.?						**Phase 2 Step 7, Phase 1 Step 5**
25. Identification of when, frequency for indicators, time of year, day, monitoring reason, etc.?						**Phase 2 Step 8, Phase 1 Step 5**
26. Identification of where data/information is needed, water bodies, station location, up/down, pre/post, etc.?						**Phase 2 Step 9, Phase 1 Step 5**
27. Written field/collection methods						**Phase 2 Step 10, Phase 1 Step 5**
28. Written Laboratory Protocols						**Phase 2 Step 10, Phase 1 Step 5**
29. Identified source of monitoring protocols (collection, field, lab, etc.)						**Phase 2 Step 10, Phase 1 Step 5**
30. Written sample shipping, handling, storing, and archiving protocols						**Phase 2 Step 10, Phase 1 Step 5**
31. Quality assurance and/or control plans field—data quality objectives..						**Phase 2 Step 10, Phase 1 Step 5**
32. Quality assurance and/or control plans lab						**Phase 2 Step 10**
33. Data management of field datasheets, standardized, validated, stored, retrievable						**Phase 2 Step 11**

Item	Have	Don't Have	DOC	Assessment of Use (Scale 0-5)	Assessment of value / effectiveness (Scale 0-4)	Comments/Notes
34. Data management for electronic data (entry, validation, stored, retrievable)						**Phase 2 Step 11**
35. Data management for meta-data, data about the results (location, who collected, etc.)						**Phase 2 Step 11**
36. Identification of meta-data and minimum data elements						**Phase 2 Step 11**
37. Data management from laboratory data (electronic, validated, stored, retrievable)						**Phase 2 Step 11**
38. Data backup, archive, data management training plan						**Phase 2 Step 11**
39. Data management for field/lab qa/qc information						**Phase 2 Step 11**
40. Standardization (naming convention, numbering convention, recording below detection, narrative results, etc.)						**Phase 2 Step 11**
41. Starting point for Data analyses for each indicator used in monitoring / assessment program (first cut at what will do)						**Phase 3 Step 12**
42 Starting point for data interpretation, conclusion, recommendations plan for each indicator used, first cut at what will do.						**Phase 3 Step 13**
43. Starting point for data communication and delivery plan, identify information exit point, what to report when, to whom, how, and who does it, first cut at plan						**Phase 3 Step 14**
44. How will data be managed to support generation of information functions and retain integrity plan?						**Phase 3 Step 15**

Item	Have	Don't Have	DOC	Assessment of Use (Scale 0-5)	Assessment of value / effectiveness (Scale 0-4)	Comments/Notes
45. List of all individuals involved in monitoring effort and role						**Phase 4 Step 16**
46. Evaluation of Plan and implementation of plan, process to review M & A results AND adjust M & A plan?						**Phase 4 Step 17**
47. Ability to communicate alignment between multiple M & A within organization? Within watershed?						**Phase 4 Step 17**
48. Identified gaps and needs and associated action plan to fulfill to fully implement M & A plan?						**Phase 4 Step 17**
49. List who was included in the development or review of M & A design						**Phase 4 Step 17**
50. Documentation of Monitoring and Assessment Plan or any aspect of?						**Phase 4 Step 18**
51. Communication of Plan, activities to do so						**Phase 4 Step 18**
52. Other?						

2. Action Plan Outline (Tool)

The Action Plan Tool is a to help you identify gaps, resources and needs in order to fully implement your M & A plan and then develop action around fulfilling those needs. As part of completing each step, you identify your needs for that step. One of the last Basic Steps has you evaluate if you need any other resources or products in order to complete this step or products to your satisfaction. If you identify a need, then the Basic Task is to document those needs in an overall action plan (see Action Plan outline).

If you were to complete each step you would possibly have Action Plans for 18 Steps (plus or minus), you would have a needs list. Remember that first you assess where you are with that step, bring that knowledge into the step, complete the step, then this action plan is a way to recalibrate your needs now that the step is done (and plan to fulfill those needs).

The plan to fulfill all identified needs is the final Action Plan. You compile all your identified needs (from each Step Action Plan) in one place, review, evaluate, prioritize and plan to meet the needs. The Basic Task in Phase 4, Step 17, has you take all the identified mini-Action Plans from each step and review all of them together once the M & A plan is drafted, and prioritize and plan to fulfill the needs or gaps. The final product would be an Action Plan to complete your M & A design and implementation.

The outline below is a Tool to provide a mechanism to put all the individual Step Action Plans into one place in order to review and evaluate. The next step to complete a final Action Plan that is sister document to your M & A Plan, is to prioritize and plan to meet the needs.

If you choose to use this tool independent from the work book, all you are doing is specifically identifying the gaps, resources and needs you have in order to fully implement your M & A Plan and then actively planning to meet those needs.

Monitoring and Assessment Action Plan Tool Instructions.

1. **Identify gaps, resources, needs and action items from every relevant Phase, Step or M & A component. Be as specific as possible. The more specific the more real and more likely to be achieved.**
2. **Review, evaluate, prioritize and lay out in the time table every identified need, what is required, who will track and when it will be next evaluated.**

Action Plan Part 1, Summary:

Phase 1 Step 1:

Phase 1 Step 2:

Phase 1 Step 3:

Phase 1 Step 4:

Phase 1 Step 5:

Phase 1 Step 6:

Phase 2 Step 7:

Phase 2 Step 8:

Phase 2 Step 9:

Phase 2 Step 10:

Phase 2 Step 11:

Phase 3 Step 12:

Phase 3 Step 13:

Phase 3 Step 14:

Phase 3 Step 15:

Phase 4 Step 16:

Phase 4 Step 17:

Phase 4 Step 18:

Action Plan Part 2, What Action Will You Take?

Within the next month?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within the next 3 months?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within the next month?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within the next 6 months?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within 1 year?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within 2 years?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**
Within 5 years?	**Who will do it?**	**When/timing?**	**Obstacles / Challenges?**

3. Monitoring and Assessment (M & A) Plan Outline

The overall outline / products for the Final Monitoring and Assessment Plan are as follows. If you follow the steps in the work books, after each step you place the relevant results in this outline and at the end have a plan. You can add/subtract or edit this outline. There are more items to list; we have narrowed it what is essential to communicate. If an item is another document or electronic file, then what goes in the plan is the name of the document/file, where it is located, who is responsible for it, when it is updated, and other relevant information.

You may want to reorganize this outline once you have all the pieces; in part, it is organized in order to provide a final document for all step products to reside.

I. People Design, Phase 1
   - A. Shared Watershed Vision and Desired Outcomes (Step 1)
     1. Logic Model of Desired Outcomes/Results and activities/target audiences to employ to achieve outcomes
   - B. Keepers of the M & A Plan (Step 1)
   - C. Watershed Boundary (Step 2)
   - D. Water bodies of Interest (Step 2)
   - E. Scope Inventory Master List* (Step 2)
     1. Physical Inventory * (Step 2)
     2. People Inventory* (Step 2)
     3. Information Inventory* (Step 2)
        - a. Existing Monitoring Efforts (Step 2)
        - b. Existing Data Sources (Step 2)
     4. Inventory Action Plan* (Step 2)
   - F. Assessment Type(s) List – Monitoring Reason + Use (Step 3)
     1. Monitoring Question(s) (Step 4)
     2. Targeted Decision Maker(s) (Step 5)
        - a. Information Needs (Step 5)
     3. Information Blue Print – Data Pathway Fact Sheet Per Monitoring Question* (Step 6)

II. Technical Design, Phase 2

A. What (Indicators, Benchmarks, etc.) and why? (Step 7)

B. When and why? (Step 8)

C. Where and why? (Step 9)

D. (W)how will meet data quality objectives? (Step 10)

1. Data quality objectives (Step 5 and 10)
2. Quality Assurance and Control Measures (Quality Assurance and Control Plan)* (Step 10)

E. Data Management for Raw Data (Data Management Plan Part 1)* (Step 11)

III. Information Design, Phase 3

A. Data Summary and Analyses (Step 12)

1. Starting Point (Step 12)
2. Changes (Later)

B. Data Interpretation, Conclusions, Recommendations

1. Starting Point (Step 13)
2. Changes (Later)

C. Communication and Delivery

1. Starting Point (Step 14)
2. Changes (Later)

D. Management Plans to Generate Information (Data Management Plan Part 2)* (Step 15)

IV. Evaluation Design, Phase 4

A. Who Will Do What? (Step 16)

1. Task Identification Matrix (Step 16)
2. Communication Structure and Tools (Step 16)

B. Evaluation Plans (Step 17)

1. Evaluation Plans for M & A Components (Step 17)
2. Evaluation Plans for M & A Implementation (Step 17)
3. Evaluation of inter/intra M & A Activities (Step 17)

C. Documentation and Communication (Step 18)

1. M & A Plan (**this document**, updated Sub documents) (Step 18)
2. Communication and Peer Review Plan (Step 18)
3. Action Plan* (Step 17)

**Italics mean a sub plan that might be attached or live somewhere else, location of document and contact is what would go in the plan*

J. Rocky Mountain Watershed Network

The Rocky Mountain Watershed Network is a regional partnership of groups who work to protect watersheds through volunteer monitoring. Consisting of service providers, monitoring groups, government agencies and programs, conservation groups, universities and non-profit organizations, the RMWN promotes and supports volunteer monitoring through technical guidance, information exchange and organizational development. We cover from New Mexico to Montana and the Dakota's.

The ultimate goal of the Rocky Mountain Watershed Network is to help maintain, protect and restore the waters of the region. The RMWN achieves this goal through its objective of promoting and supporting volunteer monitoring programs at the regional, state and watershed levels. Specifically, the RMWN will work towards promoting and supporting volunteer monitoring using the following benchmarks:

- Benchmark #1. Watershed-based monitoring. Monitoring is conducted in the context of the watershed and not geo-political boundaries
- Benchmark #2. Stakeholder driven monitoring. Stakeholders develop their monitoring program based on their goals and concerns.
- Benchmark #3. Effective monitoring. The right data is collected at the right time with the right methods to answer the stakeholders' questions.
- Benchmark #4. Evaluated monitoring. The monitoring process and design are evaluated regularly.
- Benchmark #5. Networked monitoring. Monitoring answers local questions but is connected to other monitoring efforts just as watersheds are connected.

Membership is available free of charge to any individual, organization or agency with an interest in promoting or supporting volunteer monitoring within the Rocky Mountain watershed. For more information visit www.rmwn.org.

Rocky Mountain Watershed Network
PO Box 163
Marvel, CO 81329,
www.rmwn.org, 970/382-6667
RMWNinfo@aol.com

K. References

1. Table 1 presents examples of recommended core and supplemental water quality indicators. The Consolidated Assessment and Listing Methodology [4] provides additional information on considerations for selection of supplemental indicators (see http://www.epa.gov/owow/monitoring/calm.html, Chapter 11).

2. http://www.epa.gov/owow/monitoring/elements

3. http://www.epa.gov/watershed/funding

4. EPA Watershed Academy, http://www.epa.gov/watershedacademy

5. Furniss, M. 2001. Some lessons learned in the Pacific Northwest from federal watershed analysis: ideals and pitfalls. Pp. 161-163 in : Proceedings of the 8th Biennial Watershed Management Conference, U.C. Water Resource Center Report No. 101, Riverside, CA.

6. *California Watershed Assessment Manual* ***Draft***, http://cwam.ucdavis.edu/Manual_chapters.htm, Chapter 1 and 2.

7. EPA, Why Watersheds?, http:/www.epa.gov/owow/watershed/why.html, and grant sources.

8. River Network, www.rivernetwork.org, for river protection, Clean Water Act information, technical assistance, fundraising alerts, River Voices and other publications and on-line resources, http://www.cleanwateract.org

7. Center for Watershed Protection, manuals, trainings, multiple resources, www.cwp.org, including *The Practice of Watershed Protection.*

8. Information on key issues relating to sprawl, www.plannersweb.com/sprawl/

9. Smart Growth Network, www.smartgrowth.org

10. American Fisheries Society, many publications and books, ww.fisheries.org

11. Resources from Australia, www.rivers.gov.au

12. National Water Quality Monitoring Council,

13. Test your watershed management knowledge with this ten question quiz, http://www.epa.gov/watertrain/watershedmgt/selftest.html

14. USEPA, Resources for Planning New Data Collections, http://www.epa.gov/quality/rnewdata.html

15. EPA's Watershed Academy Courses (on-line), http://www.epa.gov/watertrain

L. Resources

Contents in Overview Resource Guide:

1. Ten Elements recommended by EPA for state monitoring and assessment programs.

RESOURCE GUIDE

Overview

Contents

EPA Nine Elements of a State Watershed Assessment

1. ***Monitoring Program Strategy that:***

- Is comprehensive serving all water quality management needs and addresses all State water, including all waterbody types (e.g., streams, rivers, lakes, Great Lakes, reservoirs, estuaries, coastal areas, wetlands, and groundwater).
- Is long-term, include an implementation plan and timeline, not to exceed ten years (8), for completing implementation of the strategy.
- Identifies the technical issues and resource needs that are currently impediments to an adequate monitoring program.
- Contains a description or references how the monitoring elements described in the remainder of this document will be achieved.
- Managers of state programs work with other state managers and interested stakeholders, Federal water quality and land management agencies, volunteer monitoring organizations, and academic institutions) as they develop their strategy.

2. ***Monitoring Objectives that:***

- Serve management needs and objectives that include but are not limited to Clean Water Act goals. The State may have additional objectives for its own purposes. Clean Water Act objectives include:

    - Establishing, reviewing, and revising water quality standards (Section 303(c)).
    - Determining water quality standards attainment (Section 305(b)).
    - Identifying impaired waters (Section 303(d)).
    - Identifying causes and sources of water quality impairments (Sections 303(d), 305(b)).
    - Supporting the implementation of water management programs (Sections 303, 314, 319, 402, etc.).
    - Supporting the evaluation of program effectiveness (Sections 303, 305, 402, 314, 319, etc.).

    In general, a monitoring program that meets the Clean Water Act objectives should be able to answer the following five questions:

1. What is the overall quality of waters in the State? Under Section 305(b) of the Act, the State determines the extent to which its waters meet the objectives of the Clean Water Act, attain applicable water quality standards, and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife (40 CFR 130.8).

2. To what extent is water quality changing over time? The State assesses and reports on the extent to which control programs have improved water quality or will improve water quality for the purposes of ". . . the protection and propagation of a balanced population of shellfish, fish, and wildlife and . . . recreational activities in and on the water" (40 CFR 130.8(b)(2) and 130.8(b)(1)). Under Section 319(h)(11) of the Act, a State with Section 319 grants reports on reductions in nonpoint-source loadings and related improvements in water quality. Under Section 314(a)(1)(F), a State reports on the status and trends of water quality in lakes. The State may address these requirements through the use of models (for load estimations) and by tracking trends in use assessments. The State also should be able to identify emerging environmental issues related to new pollutants or changes in activities within watersheds.

3. What are the problem areas and areas needing protection? Under Section 303(d), the State must identify impaired waters. The State should also identify waters that are currently of high quality and should be protected from degradation. In order to protect and restore waters, State monitoring and assessment programs should identify the causes and sources of impairment.

4. What level of protection is needed? The State establishes the level of protection that is being monitored against. For example, the State uses data from monitoring programs to conduct triennial reviews of state water quality standards, conduct use attainability analyses, develop and adopt revised designated uses and water quality criteria, establish water quality-based effluent limits in NPDES permits, establish total maximum daily loads, and assess which levels of best management practices for nonpoint sources are most appropriate.

5. How effective are clean water projects and programs? The State monitors to evaluate the effectiveness of specific projects and overall programs, including but not limited to Section 319 (nonpoint source control), Section 314 (Clean Lakes), Section 303(d) Total

Maximum Daily Loads (TMDLs), Section 402 NPDES permits, water quality standards modifications, compliance programs (Discharge Monitoring Report information), and generally to determine the success of management measures.

3. ***Monitoring Design that:***

- The approach and rationale for selection of monitoring designs and sample sites that best serve its monitoring objectives**.** The State monitoring program will likely integrate several monitoring designs (e.g., fixed station, intensive and screening-level monitoring, rotating basin, judgmental and probability design) to meet the full range of decision needs. The State monitoring design should include probability-based networks (at the watershed or state-level)

that support statistically valid inferences about the condition of all State water types, over time.

- When developing designs to meet specific objectives, the EPA encourages States to consider those designs used by EPA's Environmental Monitoring and Assessment Program (EMAP) (probabilistic site selection using simple random, stratified, or nested designs) and the U.S. Geological Survey's National Water Quality Assessment program (targeted, judgmental design based on land use, geological setting, and other natural and human influences). An integrated design for assessing water quality incorporates multiple tools in a tiered approach to address management decisions at multiple scales. The efficiencies of an integrated design should extend beyond monitoring costs to program costs because it can help States prioritize which waterbodies need more immediate attention.
- Address monitoring objectives outlined in Section B, above. The design should include a comprehensive approach to assessment using multiple indicators [1,2], for all State waters on a continuing basis. The elements of the monitoring design should support the State's estimation of the amount or percentage of waters that are impaired Statewide, for each waterbody type, with a high degree of confidence. The State is encouraged to use a design that allows for estimations to within ±10% at a 90% confidence level for Statewide designs.
- The selected monitoring design yields scientifically valid results and meets the needs of the decision maker. The monitoring design should incorporate appropriate methods to control decision errors and balance the possibility of making incorrect decisions. The levels of precision and confidence should be appropriate to the monitoring objective and the type of data collected.

4. ***Core and Supplemental Water Quality Indicators:***

- States should use a tiered approach to monitoring that includes a core set of baseline indicators [1, 2]**, s**elected to represent each applicable designated use, plus supplemental indicators selected according to site-specific or project-specific decision criteria, because limited resources affect the design of water quality monitoring programs. Using this tiered approach, the State should be able to make the best use of its resources to meet water quality decision needs, including assessing water quality standards attainment and designated use support, identifying needed changes to water quality standards, describing causes and sources of impairments, developing water quality-based source controls, and assessing whether physical, chemical, and biological integrity are supported.
- Define a **core** set of indicators (e.g., water quality parameters) for each water resource type that include physical/habitat, chemical/toxicological, and biological/ecological endpoints as appropriate, that reflect designated uses, and that can be used routinely to assess attainment with applicable water quality standards throughout the State. This core set of indicators is monitored to provide Statewide or basin/watershed level information on the fundamental attributes of the aquatic environment and to assess water quality standards attainment/impairment status. Previously, chemical and physical indicators were emphasized; however, biological monitoring and assessment should assume a more prominent role in State monitoring. [2, 3].

- The strategy should also describe a process for identifying **supplemental** indicators to monitor when there is a reasonable expectation that a specific pollutant may be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern. Supplemental indicators are often key to identifying causes and sources of impairments and targeting appropriate source controls. These supplemental indicators may include each water quality criteria in the State's water quality standards, any pollutants controlled by the National Pollutant Discharge Elimination System (NPDES), and any other constituents or indicators of concern.

Table 1. Recommended water quality indicators for general designated use categories

Recommended Core and Supplemental Indicators				
	Aquatic Life &Wildlife	**Recreation**	**Drinking Water**	**Fish/Shellfish Consumption**
Recommended Core Indicators	*Condition of biological communities (EPA recommends the use of at least two assemblages) *Dissolved oxygen *Temperature *Conductivity *pH *Habitat assessment *Flow *Nutrients *Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: *Eutrophic condition Additional indicators for	*Pathogen indicators (*E. coli*, enterococci) *Nuisance plant Growth *Flow *Nutrients *Chlorophyll *Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: *Secchi depth Additional indicators for wetlands: *Wetland hydrogeomorphic	*Trace metals *Pathogens *Nitrates *Salinity *Sediments/TDS *Flow *Landscape conditions (e.g., % cover of land uses)	*Pathogens *Mercury *Chlordane *DDT *PCBs *Landscape conditions (e.g., % cover of land uses)

	wetlands: *Wetland hydrogeomorphic settings and functions	settings and functions		
Supplemental Indicators	*Ambient toxicity *Sediment toxicity *Other chemicals of concern in water column or sediment *Health of organisms	*Other chemicals of concern in water column or sediment *Hazardous chemicals *Aesthetics	*VOCs (in reservoirs) *Hydrophyllic pesticides *Nutrients *Other chemicals of concern in water column or sediment *Algae	*Other chemicals of concern in water column or sediment

5. *Quality Assurance*

- Quality Management Plans and Quality Assurance Project Plans are developed, maintained, and peer reviewed in accordance with EPA policy to ensure the scientific validity of monitoring and laboratory activities. The Quality Management Plan (QMP) documents how the State monitoring program will plan, implement, and assess the effectiveness of its quality assurance and quality control operations. Quality Assurance Project Plans (QAPPs) document the planning, implementation, and assessment procedures for a particular project, as well as any specific quality assurance and quality control activities. EPA guidance on developing QMPs and QAPPs is available at http://www.epa.gov/quality/
- These plans should reflect the level of data quality that is appropriate for the specific uses of the data, such as comprehensive assessment and listing of impaired waters, TMDL development, NPDES permit issuance, and NPS effectiveness. Data quality and quantity needs are expected to vary according to the consequences of the resulting water quality decisions.
- Under 40 CFR 130.4(b), State monitoring programs are to include collection and analysis of physical, chemical, and biological data, and quality assurance and control programs to ensure the data are scientifically valid. Under 40 CFR 31.45, if a grantee's project involves environmentally related measurements or data generation, the grantee must develop and implement quality assurance practices consisting of policies, procedures, specifications, standards, and documentation sufficient to produce data of adequate quality to meet project objectives and minimize loss of data due to out-of-control conditions or malfunctions.

6. *Data Management*

- The State uses an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, and biological data (following appropriate metadata and State/Federal geo-locational standards) with timely data entry and public access. EPA's new STORET (STOrage and RETrieval) system provides an accessible, nationwide central repository of water information of known quality. In the future, EPA will require that all States use STORET either directly or indirectly (e.g., via the Central Data Exchange (CDX) which will include the Monitoring Data Standard). See http://www.epa.gov/storet/ for further information on STORET, including system updates for users and instructions on how to download data via the Web.
- In addition, the State should store its assessment information in an accessible electronic database. For the 2004 305(b) reports and 303(d) lists, EPA strongly recommends that all States use either the Assessment Database (ADB) or an equivalent relational database for storing WQS attainment status for each assessment unit. See Appendix B of the 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance* [5] for further information on the electronic reporting format. This guidance is available at: www.epa.gov/owow/tmdl/2002wqma.html
- The State also provides appropriate geospatial data to enable the use of current Geographic Information System (GIS) tools. The 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance*, Appendix B, asks states to define the geographic location of assessment units using the National Hydrography Dataset (NHD). The use of NHD is strongly recommended for the 2004 305(b) reports and 303(d) lists. The 1998 Content Standard for Digital Geospatial Metadata [6] to label geospatial datasets applies to States and EPA. It provides for characterizing geospatial data so that users can determine the data's fitness for their purpose. For more information, visit http://www.fgdc.gov/metadata/metadata.html.

7. ***Data Analysis/Assessment***

- The State has a methodology for assessing attainment of water quality standards based on analysis of various types of data (chemical, physical, biological, land use) from various sources, for all waterbody types and all State waters. The methodology should describe how existing and available data and information relevant to applicable water quality standards, including both core and supplemental indicators, will be compiled and analyzed to make attainment decisions about State waters. The methodology describes how the state integrates its primary data - collected specifically for making attainment decisions according to a State QAPP - with data from secondary sources, collected for a variety of purposes under a variety of quality control practices. (Secondary data could include, for example, volunteer monitoring data or discharge monitoring reports.) The methodology should:

    - Identify the required or likely sources of existing and available data and information and procedures for collecting or assembling it;
    - Describe or reference requirements relating to data quality and representativeness, such as analytical precision, temporal and geographical representation, and metadata documentation needs;
    - Include or reference procedures for evaluating the quality of datasets; and

- Explain data reduction procedures (e.g., statistical analyses) appropriate for comparing data to applicable water quality standards.

For more information on developing assessment methodologies, see 40 CFR 130.7(b)(6)(iv) and www.epa.gov/owow/monitoring/calm.html.

8. Reporting

- The State produces timely and complete water quality reports and lists**.** The Clean Water Act requires the State to provide certain reports and lists, including those listed below. EPA encourages consolidation of reports wherever possible.

  A. The Section 305(b) water quality inventory report, which includes Section 314 Lakes Assessments, characterizes the condition and quality trends of monitored waters within the State and is due on April 1 of even-numbered years. This is the primary State monitoring program report to EPA and draws upon information from the Clean Lakes program, nonpoint source program, TMDLs, and other national, State, and local assessments.
  B. The Section 303(d) list identifies all impaired waters based on existing and readily available information. The list is also due on April 1 of even-numbered years.
  C. Section 406 of the Clean Water Act, as amended by the Beaches Environmental Assessment and Coastal Health Act of 2000, requires States with Section 406 grants to submit information on monitoring and notification programs for coastal recreation waters.

- Other reports and products resulting from water monitoring program activities include, for example, reports or analyses to support triennial reviews, use attainability analyses (UAAs), standards revisions, water quality based effluent limits (WQBELs) in permits, total maximum daily loads (TMDLs), nonpoint source programs, and watershed plans.
- The *2002 Integrated Water Quality Monitoring and Assessment Report Guidance* (November 19, 2001) provides States, Territories, and authorized Tribes with guidance for integrating the development and submission of 2002 305(b) water quality reports and Section 303(d) lists of impaired waters. The Integrated Report will satisfy CWA reporting requirements for both Section 305(b) water quality reports and Section 303(d) lists.
- The State is encouraged to report to the public on water quality, taking into account the needs of interested audiences. Many States use various formats and media such as technical reports, brochures, posters and other visual aids, oral presentations, newspaper articles, and the Internet.

9. Programmatic Evaluation

- The State, in consultation with its EPA Region, conducts periodic reviews of each aspect of its monitoring program to determine how well the program serves its water quality decision needs for all State waters, including all waterbody types. This should involve evaluating the monitoring program to determine how well each of the 10 elements is addressed, and

determining how needed changes and additions are incorporated into future monitoring cycles. This evaluation will take into consideration the effects of funding shortfalls on a State's implementation of its monitoring program strategy. EPA and States recognize the importance of a nationally consistent approach for evaluating state monitoring programs.

- Since water quality monitoring programs are effective only when they meet the information needs of water quality resource managers, the State should have a feedback mechanism for reporting useful information to water quality managers and incorporating their input on future data needs. Information needs may include site-specific criteria modification studies, support for enforcement actions, validation of the success of control measures, modeling for TMDLs, monitoring unassessed waters, and other activities. Decision-makers at the national, regional, State, and local levels should be considered in this process.
- The State should evaluate its overall monitoring program as part of a continuous improvement feedback loop. This may include, for example, undertaking audits of the monitoring program, quality assurance protocols, laboratory procedures, and data assessment procedures. See 40 CFR 130.5 and 130.6.

10. General Support and Infrastructure Planning

- The State identifies current and future monitoring resources it needs to fully implement its monitoring program strategy. As part of an ongoing integrated planning process, the following needs (staff and training, laboratory resources, and funding) should be assessed, considering current conditions and planned improvements, and discussed with the Regions during negotiation for Section 106 grants and PPGs that include Section 106 funds (Note: States may rely on workload models to assess needs).
    - *Staff and Training:* The State should identify the required number of staff needed for a State monitoring program, as well as needed training for field, laboratory, data management, and data assessment staff, and should document adequacies and shortfalls. States should also address staff and staff training needs for unassessed waterbody types.
    - *Laboratory Resources:* The State should identify needed laboratory support (and should document adequacies and shortfalls) to satisfy scientifically appropriate documented methods, such as methods listed in 40 CFR Part 136, published in *Standard Methods for the Examination of Water and Wastewater*, or published by the U.S. Geological Survey. U.S. EPA also encourages the use of performance-based methods (i.e., scientifically appropriate methods that meet established criteria for accuracy, sensitivity, bias, and precision and comply with specified data quality needs or requirements).
    - *Funding:* The State should identify required funding (e.g., for salaries, training, travel, equipment, laboratory analysis) for a State monitoring program, along with anticipated sources and amounts of funding and the effects of any shortfalls.

Watershed Monitoring and Assessment
Design Workbook
Plan an Information Rich System (not Data Poor)

Training Package for Workbook Introduction and Overview

Consists of:

I. **How to Use Contents of Training Package** (this document)

II. **Training Model, Assumptions and Tips** (this document), **attached in PDF format are example training flyer, registration form, scholarship form, match documentation form.**

III. **Training Agendas** (description only this document /on CD)

A. Local Watershed Progressive Training Leadership
(Word document Localleadershipagenda05.doc)

B. Local Watershed Progressive Beginner Program
(Word document localbeginneragenda05.doc)

C. Local Watershed Progressive Existing Program
(Word document localexistingagenda05.doc)

D. Service Provider, five day Training Leadership
(Word document SPleaderagenda05.doc)

E. Service Provider, five day Participant
(Work document SPparticipantagenda05.doc)

IV. **Pre-Evaluation and Training Evaluation Tools** (description only this document / on CD)

A. Screening Tool for Local Watershed Training
(Word document localscreensurvey05.doc)

B. Pre-Evaluation Tool for Local Watershed Training
(Word document localpreevaluation05.doc)

C. Session Local Watershed Training Evaluation Tool
(Microsoft Publisher workbookstepevaluation05.pub)

D. Overall Watershed Training Evaluation Tool
(Microsoft Publisher localoverallevaluation05.pub)

E. Pre-Evaluation Tool for Service Provider Training, modify the screening tool for local watershed training if need a screening survey.
(Word document SPpreevaluation05.doc)

F. Service Provider Training Evaluation Tool, combine and modify C and D to fit Service Provider Training.

V. Slide presentations to assist with Workbook Phases (description only this document / on CD) All shows in Microsoft Power Point.

A. Overview and reasons to plan monitoring and assessment
- Whyplan05.ppt
- 18step_decisiontree_blueprint_planoutline05.ppt (vertical slides)

B. Phase 1, Steps 1-6, People Design – Build the Foundation
- Phase1Step1.ppt (Watershed Vision, outcomes)
- Phase1Step2.ppt (Scope Inventory)
- Phase1Step3.ppt (Assessment Type-monitoring reason + data use)
- Phase1Step4.ppt (monitoring questions)
- Phase1Step5.ppt (target decision makers / information needs)
- Phase1Step6.ppt (summarize Info Blue Print – Data Pathway Fact Sheet)

C. Phase 2, Steps 7-11, Technical Design – Technical Foundation
- Phase2Step7.ppt (what)
- Phase2Step8.ppt (when)
- Phase3Step9.ppt (where)
- Phase4Step10.ppt (how meet data quality objectives)
- Phase5Step11.ppt (data management of raw data)

D. Phase 3, Steps 12-15, Information Design – Turn Data into Information
- Phase3Step12.ppt (data summary and analysis)
- Phase3Step13.ppt (interpretation, conclusion and recommendation)
- Phase3Step14.ppt (communication and delivery)
- Phase3Step15.ppt (data management to generate information)

E. Phase 4, Steps 16-18, Evaluation Design – Measure Success
- Phase4Step16.ppt (Task Identification)
- Phase4Step17.ppt (Evaluation of Effectiveness)
- Phase4Step18.ppt (Communication and Documentation of Plan)

I. How to Use Contents of Training Package

This training material was developed to accompany the Monitoring and Assessment Workbooks. While the training material might provide some use out of this context, we encourage you to modify what you need but keep the context in tact. That is keep the training tied to some larger, overall monitoring and assessment framework, even if the training focuses only on an individual component or aspect of monitoring and assessment planning. At a minimum we invite you to read the Workbook Overview Section. It would be impossible to develop a workbook or training session as one size fits all, so we developed this assuming you would modify it to meet your needs.

As a reminder a local *Watershed Group* here refers to any group, formal or informal, gathered within a defined (by them) watershed boundary, can be citizen based, governmental based or mix, can be large or small, etc. Watershed groups may be concerned with a wide variety of problems or threats, implementing a wide variety of activities serving a diverse set of audiences, range in watershed values, capacity and longevity. A *Service Provider* refers to any individual or entity that provides products or services to individuals or groups on the ground, working in a watershed conducting or planning to conduct monitoring or assessment activities. A *leader* refers to any individual or group of individuals planning and conducting the trainings.

The contents of this training package are listed above. Similar to the workbook content, basic steps and worksheets, this training material is designed:

- to be a starting point, a tool to modify to serve your needs
- in a format easy to modify, in Microsoft Word or Adobe Acrobat, with simple formatting
- primarily from the local watershed group perspective or providing a training to a local water shed group, however training agendas intended to train service providers are also included
- to include evaluation before, during and after each training event

The suggestion would be to choose the leader agenda, participant agenda, evaluation tools and slide shows that align with your target audience, learning objectives and resources. This requires that you identify your target audience, learning objectives and resources before you start, regardless of what information and tools you chose to employ.

Section II describes the training model we propose as most effective to produce meaningful and measurable plans and the assumptions that support this model and associated training tools we have provided. You can decide if this training model or assumptions align with your needs and modify as necessary. This applies for our training tips, use them if they seeming valuable.

Section III provides the descriptions of the five training agendas that accompany the training model and associated assumptions from Section II. There two primary training agendas, one for local watershed groups producing or modifying an existing monitoring and assessment plan (Agendas B and C) and the other for service providers that train local watershed groups

(Agenda E). A leadership agenda is available for both training audience types. This is a scripted agenda describing what the leader is to accomplish, tools to use, etc. for each relevant item on the agenda (Agenda A local watershed groups and Agenda D for service providers). Two agendas are available for local watershed group trainings, one assumes most of the participants have no existing plan or are starting from the beginning (Agenda B), the other assumes most of the participants have a current plan they need to evaluate, modify, expand or understand (Agenda C). The content of both these agendas is the same; the difference is the starting point for each and the results of the pre-evaluation.

Section IV provides the pre-evaluation, training and post evaluation for each target audience training, local watershed group or service provider. The training model for which these training agendas were developed uses pre-evaluation, training event evaluation and post training evaluation an integral and essential component of the training in order to produce a plan period and to produce one in which progress can be measured and documented.

Section V provides a set of slides primarily to support the Phases and Steps in the Workbook. A slide presentation is available for the Workbook Overview and covers "why" planning and documenting a monitoring and assessment plan is valuable and in most cases essential to measure success.

II. Training Model, Assumptions and Tips

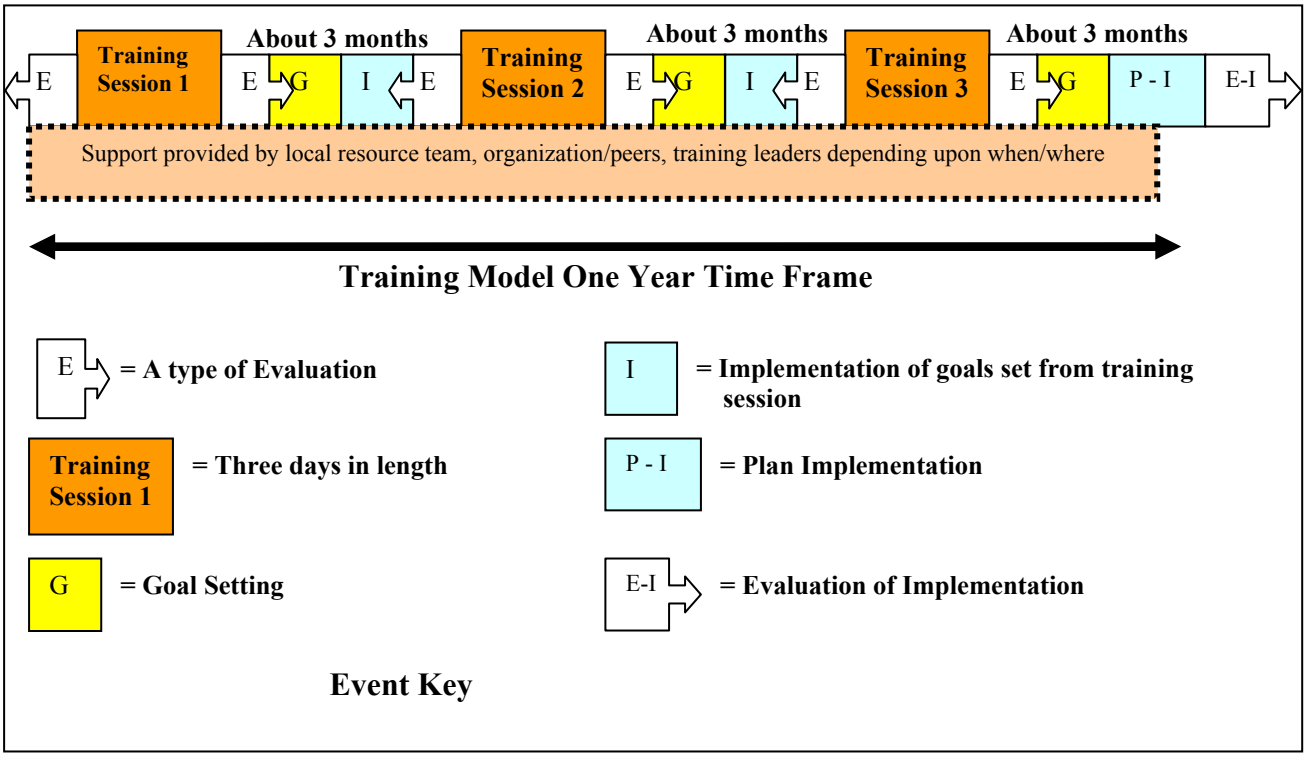
Local Watershed Progressive Training Model

Background. This training model was confirmed as a result of the pilot training. The hypothesis tested was that any training shorter than 5 days would not produce the watershed monitoring and assessment plan, increased knowledge and skill to the point the group could evaluate another plan or write their own. Learning would occur but only small bits of information and pieces. Our goal is to produce real change and plans, not small modifications to existing plans.

This training model can be modified but the essential components need to remain to be effective such as, evaluation, assessment, goal setting, hours of contact, opportunity to cost effectively involve more people, allow time for planning processes to take place and access to resources and support for some period of time. Training models and content should always be adapted to align with the needs and resources of the situation.

Training Model Overview. The training model is comprised of three separate but progressive sessions, each session being three days in length. Two to four months should occur in between each of the three sessions. Goals are set in each session that will be the focus of activities during the three months in between sessions. Support is provided and check-in times are scheduled between sessions. After the final session this formal support and checking in remains available up to three months on an as needed basis, in theory to provide support for upstart of implementation of the plan. Figure 1, attempts to illustrate the training model and components.

Figure 1. Training Model Event and One Year Time Frame



A "local" resource team is assembled for the training sessions and to provide support and scheduled reporting times for participants between sessions. Ideally this local resource team for is comprised of training leaders (as local as possible), local and regional experts. However, this will evolve on a case-by-case basis as needs and resources will vary. This local resource team will be diverse in its skill and knowledge and roles will be defined. For example, some members of the local resource team may only provide training for specific plan components; others might provide the "on-call assistance for a topic". Training leadership provides the check-in and liaison to other resources using appropriate mechanisms.

The purpose for using this training model, events, time frame, and a local resource team is to

- Provide a learning environment that increases skill as a result of increased knowledge by allowing time to use the knowledge and skill. This is akin to letting someone try and ski as you teach them how to ski versus teaching them how to ski from a video or indoors in a classroom.
- Provide a resource base that can be employed after the training sessions. This happens by increasing their confidence and ability to ask well thought focused questions, connecting groups to each other (they are not alone) and to local resource.
- To produce a watershed monitoring and assessment plan that can be implemented with available resources, can be measured and that will protect or restore the waters it was designed for.
- Leave participants with the confidence, skill and knowledge to make scientific decisions, identify degree of confidence, and to identify what questions to ask who if they don't know, to share this with other individuals and groups by their success.

Participant Starting Point. The initial session will be designed to meet local groups wherever they are in the Monitoring design process. For example if participants are all start up programs the agenda will start with Phase 1, Step 1. If all participants have existing programs, the starting point should be determined from the pre-evaluation. Our experience suggests the most common mid-starting point is with Phase 2, Technical Design, Step 11 Data Management, or Phase 3, Data to Information Design. If participants are mixed you can provide a two track training each time, if you have the resources. Regardless of starting point, the following two sessions will build from the previous session.

Individual Training Sessions. Each individual session will be hands-on, one-on-one time with the specific local resource team developed for that training session as well as each other. One or more of the Workbook Phases or Steps are covered in a hands-on participatory manner. The experts present will not provide answers but guidance.

This training model requires a commitment to engage and participate to be successful. Consequently it will not serve entities that cannot provide that focus and level of participation. It is not designed as a one size fits all. A fundamental principle of the workbooks is that entities are spending time and money monitoring and are yet unable to produce monitoring results, or measure monitoring programs results, unable to manage monitoring data or turn it into information. If the reason for this is a lack of planning, we invite those entities to stop, and put those resources into planning.

Each participant will be required to demonstrate their commitment and actively participate in the sessions by

- Signing an informal agreement and paying a nominal fee that will be refunded if they complete the training and produce a plan (barring unforeseen circumstances).
- Assisting in setting specific learning objectives.
- Involving a minimum of two, but if appropriate more entities from their organization to actively participate in the training and planning.
- Conducting honest, open and frequent evaluations and assessments.
- Bring material and information specific to their work, such as maps, data, monitoring designs, manuals, goals, hurdles, obstacles, information and unique situation to each session.
- Commit to putting something into this and we guarantee something will come out of it, we need.

In order to "graduate" from the training sessions, regardless of which step in the Monitoring design process the group began the training, the group will have to address each of the Monitoring design questions to the appropriate degree and produce a monitoring and assessment plan that aligns with their resources and organization values.

If a group is able to complete all Monitoring design steps within two sessions they graduate early. Otherwise each group will participate in all three sessions to reach completion. Goals and objectives are established after each session for each group to achieve prior to the next session. Progress can be made in between utilizing the Train-the-trainer's (TTT's) and Local Watershed Resource Team (LWRT). The format of each training will emphasize hands-on, immersion-style and require participants to bring their maps, data, monitoring designs, hurdles, obstacles, information and unique situation to each session.

Products. The minimum products from this training would be a *Watershed Monitoring and Assessment Plan*, with all the Workbook Phase Steps addressed to the appropriate degree and an *Action Plan* for those that were not or for the next steps. Other potential products produced from the workbook and training includes:

- Master Inventory List (documentation of what information, data, etc. you have)
- Inventory Action Plan (for information needed)
- Information Blue Print or Data Pathway Fact Sheet or some mechanism to summarize what you are doing, where, how, when, why and for whom and how will you measure all this?
- Data Management Plan (to manage raw data and to support turning data into information and delivering that information)
- Evaluation Plan
- Sample Operating Procedures Manual (SOP)
- Quality Assurance and Control Project Plan (QAPP)

Assumption.

This training model assumes:

1. The learning objectives are not quick fixes but a desire to produce a final product, produce real change and create a learning environment where the answers come from the participants, it is not provided for them.
2. Pre-training activities that ensure the sessions are design and planned to meet participant's needs and the participants are committed and prepared. This includes securing a commitment, screening process or interviews, self assessment, homework for first session, fees paid, training site secured, local resource team identified/committed.
3. Post-training follow up on remaining goals, product completion and use of product/plans.

Tips.

1. Plan. Conduct screening phone and paper surveys, have participants complete a pre-evaluation questionnaire in enough time for you to adapt the training content to meet their needs. Include preparation time for resource team. Assign homework to participants before first training and allow them enough time to complete the homework. A good 2-3 months is necessary before the first training session.
2. Formalize participant and resource team commitment somehow.
3. Determine, document and formally obtain local resource team support. Be clear about roles, responsibilities and valued contribution.
4. Plan how contact and follow up will occur by whom in between sessions and after last session for 6 months or so.
5. Celebrate along the way and at the end.
6. Have a mix training and feedback process, written/verbal-discussion, individual, group, etc.
7. State learning objectives and expectations clearly, have a process to hold each other accountable and check in frequently. For example, each session leave time to share what each group has completed, what not, hurdles and then before they leave to share goals and plans, and put it in writing so you have something to measure.
8. Encourage networking during, between and post sessions. Provide participant contact information to participants and resource team.
9. Use as much of time together doing real work versus paper work. Attached are examples of an agenda flyer, registration form, scholarship form and reimbursement form if they apply to your situation.

III. Training Agendas (Descriptions)

A. Local Watershed Progressive Training Leadership (word document Localleadershipagenda05.doc)

B. Local Watershed Progressive Beginner Program (word document localbeginneragenda05.doc)

C. Local Watershed Progressive Existing Program (word document localexistingagenda05.doc)

D. Service Provider, five day Training Leadership (SPleaderagenda05.doc)

E. Service Provider, five day Participant (SPparticipantagenda05.doc)

A. Local Watershed Progressive Training Leadership

This agenda is design to be a starting point for the *leaders* of a local watershed progressive training model described in the **Training Model, Assumptions and Tips** section. This provides a scripted agenda for the leadership to understand the goal or learning objective of each agenda item and instructions to help make the agenda item happen. The participant's agendas do not have these instruction scripts.

This agenda is on the CD as a word document named *Localleadershipagenda05.doc*, so you can adapt it to serve your needs.

B. Local Watershed Progressive Beginner Program

This agenda is design to be a starting point for the *beginner participants* of the local watershed progressive training model described in the **Training Model, Assumptions and Tips** section. This agenda is design for participants who are essentially starting from scratch. They may or may not have any experience, but the common starting point is that essentially no monitoring or assessment activities are currently in place. The pre-evaluation and results will be different than a group that has some level of activity in place. The questions that need to be answered and the content covered are the same, just the starting point and thus order of presentation. In the training model proposed, you could run a two track training using the same material, just starting at different points, this agenda starts with Step 1.

This agenda is on the CD as a word document named *localbeginneragenda05.doc* so you can adapt it to serve your needs.

C. Local Watershed Progressive Existing Program

This agenda is design to be a starting point for the *existing program participants* of the local watershed progressive training model described in the **Training Model, Assumptions and Tips** section. This agenda is design for participants who have some level of current monitoring and assessment activities in place. They may or may not have any experience, but the common

starting point is they have some existing products or information to evaluate; they are not starting from scratch. The pre-evaluation and results will be different than a group that is just starting. The questions that need to be answered and the content covered are the same, just the starting point and order of presentation.

In the training model proposed, you could run a two track training using the same material, just starting at different points, this agenda starts with some step beyond Step 1, usually Phase 2, Step 7, but this is determined from the pre-evaluations. The most common place folks get stuck is with technical design evaluation, data management, and data to information or overall evaluation. This example agenda starts with Phase 2, Step 7, Technical Design.

This agenda is on the CD as a word document named *localexistingagenda05.doc* so you can adapt it to serve your needs.

D. Service Provider, five day Training Leadership

This agenda is design to be a starting point for *leaders* of a Service Provider five day training described in the **Training Model, Assumptions and Tips** section. This was the recommended training model from the pilot training we conducted. This provides a scripted agenda for the leadership to understand the goal or learning objective of each agenda item and instructions to help make the agenda item happen. The participant's agendas do not have these instruction scripts. The service provider training has two parts; first participants go through the Workbook Phase Steps as if they were a watershed group. The second part of the training is focused on training to conduct local watershed trainings.

This agenda is on the CD as a word document named *SPleadershipagenda05.doc* so you can adapt it to serve your needs.)

E. Service Provider, five day Participant

This agenda is design to be a starting point for *participants* of a Service Provider five day training described in the **Training Model, Assumptions and Tips** section. This was the recommended training model from the pilot training we conducted.

This agenda is on the CD as a word document named *SPparticipantagenda05.doc* so you can adapt it to serve your needs.

IV. Pre-Evaluation and Training Evaluation Tools (Descriptions)

A. Screening Tool for Local Watershed Training (localscreensurvey05.doc)

B. Pre-Evaluation Tool for Local Watershed Training (localpreevaluation05.doc)

C. Session Local Watershed Training Evaluation Tool (localworkshopevaluation05.pub)

D. Overall Watershed Training Evaluation Tool (localoverallevaluation05.pub)

E. Pre-Evaluation Tool for Service Provider Training (SPpreevaluation05.doc), modify the screening tool for local watershed training if need a screening survey.

F. Service Provider Training Evaluation Tool, combine and modify C and D to fit Service Provider Training.

A. Screening Tool for Local Watershed Training

This tool is designed for trainers to conduct a pre-interview and screen applicants as to their readiness and commitment to this training and to understand who they are and where they are in the monitoring and assessment planning process. Modify to meet your needs. There are some questions that may or may not be appropriate. This could be part of a registration packet or follow closely after a registration is received. It should be turned in before the pre-evaluation. Additional questions can easily be added to serve as a screening and commitment tool for the Service Provider Training also.

B. Pre-Evaluation Tool for Local Watershed Training

This tool is designed for participants to evaluate where they are with each Workbook Monitoring and Assessment Phase and Step product. Thus, the questions and terminology align with the work book. This can be modified to meet your needs.

A pre-evaluation is essential for planning a training session that will be relevant for the participants. This, combined with the phone interview(s), will determine where the participants are at, so you can "start" and to some degree the depth you need to cover for each step. It will also determine who in the local resource team you will need when and for what. Finally, the way the workbook is designed, the first worksheet involves and evaluation of where the participant is versus where they want or need to be, setting up the context for the participant needs in that step.

The pre-evaluation included here covers all Workbook Phase Steps and resulting products.

C. Session Local Watershed Training Evaluation Tool

This evaluation tool is designed to evaluate each training session and the specific Workbook Phase Steps covered. If all Phases and Steps are completed, the product of Phase 4, Step 17 is an evaluation plan to evaluate essential monitoring and assessment plan components during/after implementation. In addition this step offers tools to evaluate how multiple monitoring and assessment plans within an organization or watershed can be evaluated for common indicators, stations, sample frequencies, purposes, monitoring questions, targeted decision makers and or information needs. The format of this form is in Microsoft Publishing.

D. Overall Local Watershed Training Evaluation Tool

This evaluation tool is designed to evaluate the overall training session success or failure. There is a component that addresses evaluation of after training follow up that might need to be asked later. This form might be modified to ask key questions after each break and during a few intervals following the last session. The format of this form is in Microsoft Publishing.

E. Pre-Evaluation Tool for Service Provider Training

In order for Service Providers to provide a meaningful training, they themselves need to know enough about the material to conduct the training but also need to understand enough about the perspective of the student. Thus this evaluation covers what each Service Provider knows about each Workbook Phase Steps.

This training uses the same hands-on immersion approach as the local watershed group training. The service providers first go through the Workbook Phase Steps as if they were a watershed group. The second part of the training is focused on training to conduct local watershed trainings. This tool is designed for participants to evaluate where they are with each Workbook Monitoring and Assessment Phase and Step product. Thus, the questions and terminology align with the work book. This can be modified to meet your needs.

F. Service Provider Training Evaluation Tool

This evaluation is designed to evaluate each aspect of the Service Provider five-day training agenda/components. It is suggested and encouraged that a part of the evaluation include a follow up with each Service Providers at various intervals for a period of time to understand what parts of the training they have put into action and at what success. This is not provided, but you would combine evaluation tools C and D above and modify as needed.

V. Slide Presentations to assist with Workbook Phases (Descriptions)

There are 20 slide presentations available for you to use or adapt:

1. Overview of monitoring and assessment components and why designing or planning monitoring and assessment are essential**, 19)** Whyplan05.ppt, also ***20)*** 18step_decision tree_blueprint05.ppt, provides an overall 18 step slide a slide illustrating decision tree from Step 5 and the information blue print – data pathway fact sheet summary from Step 6. These slides are vertical.

   Each step has a slide show that could stand alone. They each contain introduction slides, where in the process of all steps this step fits slides, then the basic steps and products for each step and any additional slides that help convey the content for this step. These could be combined to produce a Phase slide show. Only the overview and Step one are actually printed, the remainder of slide presentations are provided on the CD.

2. Watershed Monitoring and Assessment Slides for Phase 1, Steps 1-6:

   People Design – Build the Foundation

   Step 1 Share Watershed Vision and Desired Outcomes (results) (**1**-phase1step1.ppt)

   Step 2 Scope Inventory (Physical, People and Information) (**2**-phase1step2.ppt)

   Step 3 Identify Monitoring Reason(s) and Data Use(s) (Assessment Type) (**3**-phase1step3.ppt)

   Step 4 Develop Monitoring Questions (Refinement of Monitoring Reason) (**4**-phase1step4.ppt)

   Step 5 Target Decision Makers and Information Needs (Refinement of Data Use) (**5**-phase1step5.ppt)

   Step 6 Summarize with an Information Blue Print – Data Pathway Fact Sheet (**6**-phase1step6.ppt)

3. Watershed Monitoring and Assessment Slides for Phase 2, Steps 7-12

   Technical Design – Generate Data

   Step 7 What will you monitor? (**7**-phase2step7.ppt)

   Step 8 When will you monitor? (**8**-phase2step8.ppt)

   Step 9 Where will you monitor? (**9**-phase2step9.ppt)

   Step 10 (W)How will you meet Data Quality Objectives? (**10**-phase2step10.ppt)

   Step 11 Management of Raw Data (*Data Management Plan* Part 1) (**11**-phase2step11.ppt)

4. Watershed Monitoring and Assessment Slides for Phase 3, Steps 12-15

   Information Design – Turn Data Into Information

   Step 12 Data Summary and Analysis (**12**-phase3step12.ppt)

   Step 13 Interpretation, Conclusions and Recommendations (**13**-phase3step13.ppt)

   Step 14 Communication and Delivery (**14**-phase3step14.ppt)

Step 15 Management to Generate Information (Data Management Plan Part 2)

(**15**-phase3step15.ppt)

5. Watershed Monitoring and Assessment Slides for Phase 4, Steps 16-18

Evaluation Design (Measure Success)

Step 16 Who Will Do What? (Task Identification) (**16**-phase4step16.ppt)

Step 17 Evaluation of Effectiveness (of Plan and Implementation) (**17**-phase4step17.ppt)

Step 18 Documentation and Communication (**18**-phase4step18.ppt)